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GUIDELINES FOR SAFER COMMUTE TO SCHOOLS

(First Revision)

INDIAN ROADS CONGRESS

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GUIDELINES FOR SAFER COMMUTE TO SCHOOLS

1. CHILDREN AND VEHICLE DRIVERS AS ROAD USERS

RC:SP:32 was published in the year 1988. To keep pace with the ever changing road traffic nvironment and to eradicate the gap in availability of professional guidelines, it was decided to evise these guidelines. The Urban Roads and Streets Committee (H-8) of IRC took up this task of evision and a subgroup comprising Dr. Mukti Advani (Subgroup Chairman), Dr. S. Velmurugan, Shri Advait Jani, Dr. Anjlee Agarwal, Ms. Jagriti Arora, Shri Amit Bhatt, Shri Swatantra Kumar, Dr. Ch. Ravi Sekhar and Dr. Neelima Chakrabarty was constituted. The draft revision prepared by the subgroup was deliberated in various meetings of H-8 Committee and was finalized in its meeting held on 13.09.2022.

The composition of H-8 Committee is given below:

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Secretary General, Indian Roads Congress Nirmal, S.K.

The revised draft document was placed before the HSS Committee in its meeting held o 24.09.2022. The HSS Committee approved this draft revision subject to suitably incorporatin written and verbal comments received and also recommended it for placing before the meeting of Executive Committee (EC) and Council. The EC in its meeting held on 07.10.2022 approve the draft revision for placing before the Council. The 223rd Council in its meeting held o 8th October, 2022 at Lucknow (Uttar Pradesh) considered and approved draft revision of IRC:SP:3 "Guidelines for Safer Commute to Schools" for printing.

Children differ from adults cognitively and anatomically. This calls for a deeper understandin of children as road users. Due to their developing cognition coupled with mobility, childre are at higher risk of injuries. Furthermore, with the onset of middle childhood (6 to 10 years) children begin to display independence and mobility. This motivates them to explore and see environments without adult supervision. It is an established fact that the road traffic environmen exerts some form of cognitive load on children across age groups. At the same time, adolescen children with their relatively more developed cognition might get easily distracted. Some of thes complexities include identifying safe crossing gaps, the vision of vehicles in two directions o travel, the anticipation of vehicle arrival in two directions of travel as well as coping with visua obstructions such as parked cars, bushes and inclines on the road. Additionally, children wit disabilities require assistance or need to be escorted due to physical and cognitive barriers.

Adult supervision can make a significant difference in risk exposure for children. The physica proximity of an adult is interpreted by a child as an adult's readiness to intervene in case of mishap. Unaccompanied children can thus be more exposed to risk. While the existing environmen might be safe for some, the younger lot cannot be expected to adapt to the road environmen They are biologically incapable of catering to their demands. Traffic environments should thu be better designed according to the cognitive abilities of children rather than children adaptin to the complexities of traffic. Additionally, children, as a group are not uniform. Based on factors like gender, age, and disability, the probability and severity of crashes varies. To ensure that a children are safe, the most vulnerable should be protected. Thus, the cognitive and physica capabilities of the children with intellectual and physical disabilities should be considered as th benchmark for minimum or non-negotiable standards.

Additionally, body physique also plays a role. As children have proportionately large heads an high centre of gravity (CG), their body fulcrum and CG is located above the waist, making ther susceptible to falling headfirst. Children's heads are relatively massive and supported poorly fro below which makes them susceptible to head snapping and, in turn, traumatizing related nerve blood vessels and spinal cord segments, in case of any fall due to road crashes.

Children also lack a fully developed skull to cushion them from brain injuries. It is, therefor necessary to make sure vehicle speeds are restricted within school zone to reduce not only th conflicts but also the severity of conflict with children. The safety of children in areas arou schools i.e. school zone development depends more on the vehicle drivers than on the childre

whether the school is located in a typical urban environs or the school is located on the highways or roads passing through urban development. Therefore, it is important to convey to a vehicle driver if she / he is approaching the school zone and should be kept informed until she / he leaves the school zone area. At the same time, it should be ensured that the vehicle drivers should not be overloaded with information. For this, certain design interventions are required. This shall include engineering aspects in the form of provision of Traffic Calming measures in the form of Speed Tables, Speed Breakers / Rumble Strips depending on the site requirements, as well as placement of suitable traffic control devices in the form of road signs (like the Speed Limit Sign, No Horn Sign and ending with the Restriction End Sign) coupled with zigzag markings of the edges and the traffic lanes (using yellow thermoplastic paint) covering the entire built environment of the school zone along with or Zebra Crossing at the designated crossing locations which is equipped with Speed Table will go a long way in ensuring safe commuting environs for the children in the school zones.

In summary, the suggested engineering measures conforming to IRC:99 encompasses various forms of traffic calming measures like Speed Tables and Transverse Bar Markings (TBM) shall be implemented in the school zone including the access areas to the school. Further, the suitable traffic control devices conforming to IRC:67 and IRC:35 shall be implemented in the vicinity of the school zone located on a typical urban environs i.e. city or any type of inter-urban road passing through a school environment which is typically observed on Indian roads. These guidelines serve as a reference to provide the various measures in school zone located in a typical city / urban road or all types of inter-urban passing through school environment.

2. DEFINING SCHOOL ZONE

A school zone refers to an area around school covering road network which may encompass streets / roads, bus stops, intersections and parking areas or some of them depending on the type of development and the very location of the school. Within this area, movement of higher number of children is expected especially during the school opening and closing times. Level of road safety within the school zones is highly dependent on its location, building layouts, age of students. To address the above, this document defines school zone by considering the following aspects:

- Location parameters include the type of road (s) within school zone area which can be ranging from kaccha (unpaved) road to National Highways. Type of intersecting area i.e. signalised, un-signalised, roundabout, grade separators, etc.
- Layout of existing schools may have entry / exit gates opening on road/service lanes/at intersection. This also includes the activity on the street based on adjoining plots and land use.
- School bus parking and drop off / pick up area should be provided within or outside the school premises. The commute to school also involves provision of parking space for children commuting by cycle, teachers, and staff vehicles within the campus. Further, it should also encompass designated drop off locations for school vans, bicycles, and para transit such as rickshaw, e-rickshaw, three wheeled auto rickshaw parking.

Considering the decreasing likelihood of presence of school children as one moves away from a school, a school zone shall be divided into the School Access Zone and the School Proximal Zone. This is further supplemented by a Transition Zone, which will not be a part of the school zone but it should be considered as essential component aimed at providing smooth transition into the school zone.

2.1 School Access Zone (SAZ)

A School Access Zone (SAZ) may be understood as the road (s) leading to every entrance of a school, extending 100 m on either side of the school entrance (s), as explained in **Fig. 2.1**. If a school has more than one entrance, it will have more than one SAZ. The speed limit in SAZ located on the arterial, sub-arterial and collector roads should not exceed 25 kmph whereas the speed limit in SAZ located on the local street should not exceed 20 kmph.

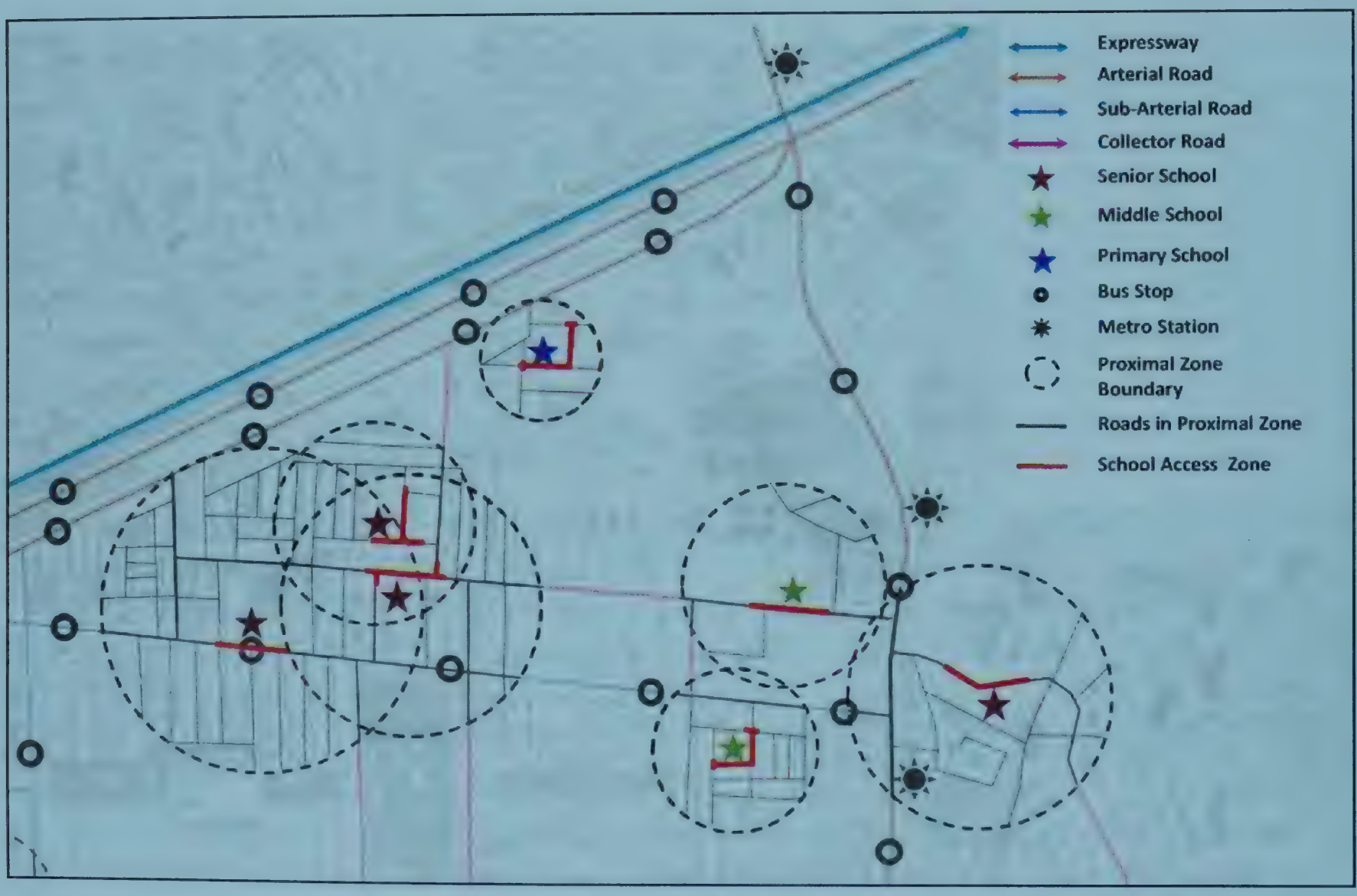


Fig. 2.1 Extent of School Proximal Zones and School Access Zones

If there is an intersection within 100 m from school entrance gate, on either of its side, then the SAZ shall extend from the entrance gate to 30 m beyond the intersection, in the direction going away from the school, as explained in **Fig. 2.2**. If a school entrance gate opens at an intersection, it is preferred to relocate/reorient the gate, if not possible, then the SAZ shall extend from the school gate to at least 100 m covering all arms of the intersection.

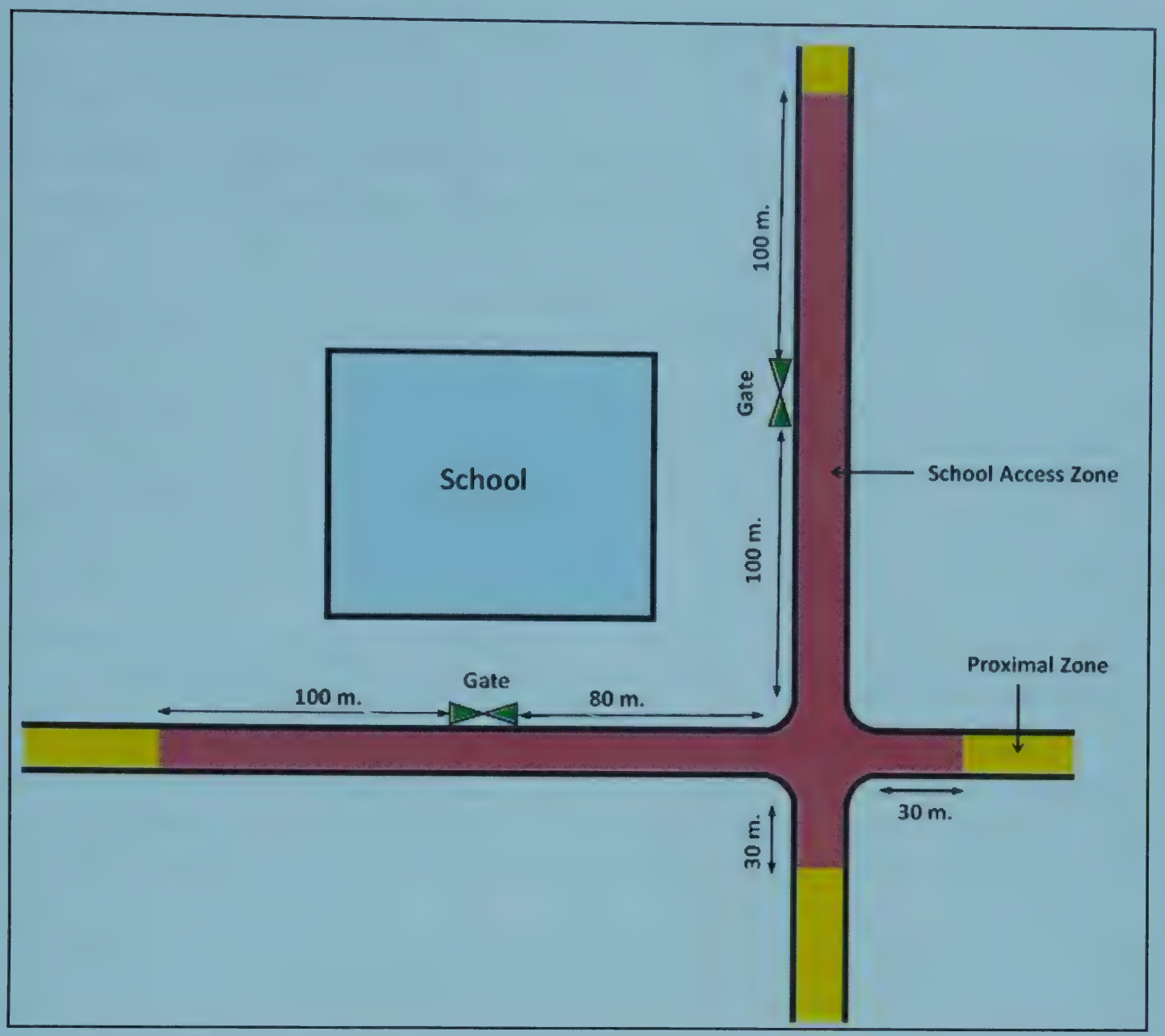


Fig. 2.2 Typical Layout of School Access Zone located near an Intersection

The SAZ shall be characterised by the strictest engineering and enforcement interventions across all school sub-zones which is elaborated in this document. For educational institutes catering only to children below primary school level, like play school, nursery school, etc., the shortest route from the school to the nearest public transit stop shall be treated as SAZ. The need to delineate SAZ arises because irrespective of students' mode of travel, it is in this zone where almost all students studying in the respective school will ultimately congregate at least twice a day.

2.2 School Proximal Zone (SPZ)

A School Proximal Zone (SPZ) may be understood as the area around the school within which most students of that school will be present on roads, as they commute between home and school either by walk, cycle or public transport. The radius of the SPZ shall vary based on the age group of students in a school and the road classification on which school is situated, as shown in **Table 2.1**.

Table 2.1 Radius for School Proximal Zone

Road Type	Primary (m)	Secondary (m)	Senior Secondary (m)
Urban Roads / Interurban Roads	400	450	500
Arterial Roads / Highways	300	350	400
Collector Street / Other District Roads	200	250	300
Local Streets / Other Roads (including PMGSY Roads)	150	200	250

Note:

1. In the unlikely event of a school being situated along an Urban Expressway, the local authorities shall make sure that the entry / exit to the service lanes do not open in front of the school gates.

2. If a school opens on to the service road of an Urban Expressway, then that service road shall be treated as a sub-arterial road while in the school zone and all interventions recommended for arterial roads will be applicable.

3. If a school has more than one age group of students, then the values for the oldest age group studying in the school, shall be considered as the zone radius for that school.

4. Since children below primary school are almost always accompanied by an adult, demarcation of a school proximal zone for any educational institute catering to such young age group, is not mandatory.

Unlike the SAZ which is limited to the streets along which a school's entrance is situated, the SPZ shall include all roads within the applicable zone radius, excluding the SAZ. For delineating the SPZ, the school entrance gate which is used by most students shall be used as centre of the zone and then the applicable radius may be used to draw the zone circle (**Ref. Fig. 2.3**).

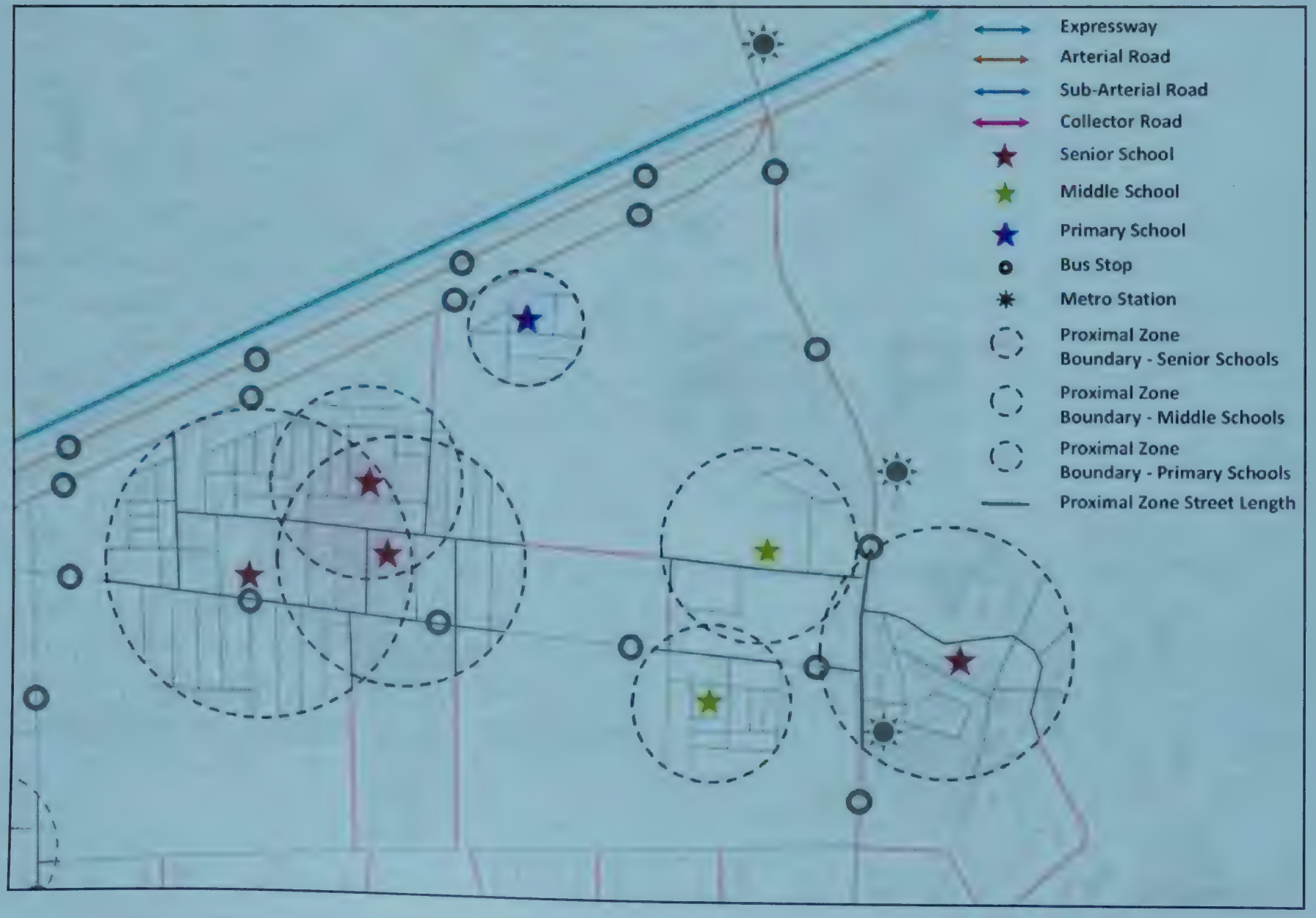


Fig. 2.3 Zone Boundaries of School Proximal Zone and School Access Zone

While delineating the SPZ, there are certain boundary conditions that can alter the geometry of the zone, making it more amoebic. These conditions are explained and graphically depicted in **Fig. 2.4**

- If an intersection is situated within 20% of the applicable zone radius, then the SPZ shall be extended till 30 m beyond on all arms of the intersection, in the direction moving away from the school.
- If a Public Transit (PT) stop such as a bus stop, metro station or hub including stage / route operated Intermediate Para Transit (IPT), Stops is situated within 20% of the applicable zone radius, then the SPZ shall be extended to include such types of PT stop as well. For easy reference of the values of 20% of the applicable zone radius covering the various functional classification of the roads, the figures presented in **Table 2.2.** These values shall be used by the road authorities.

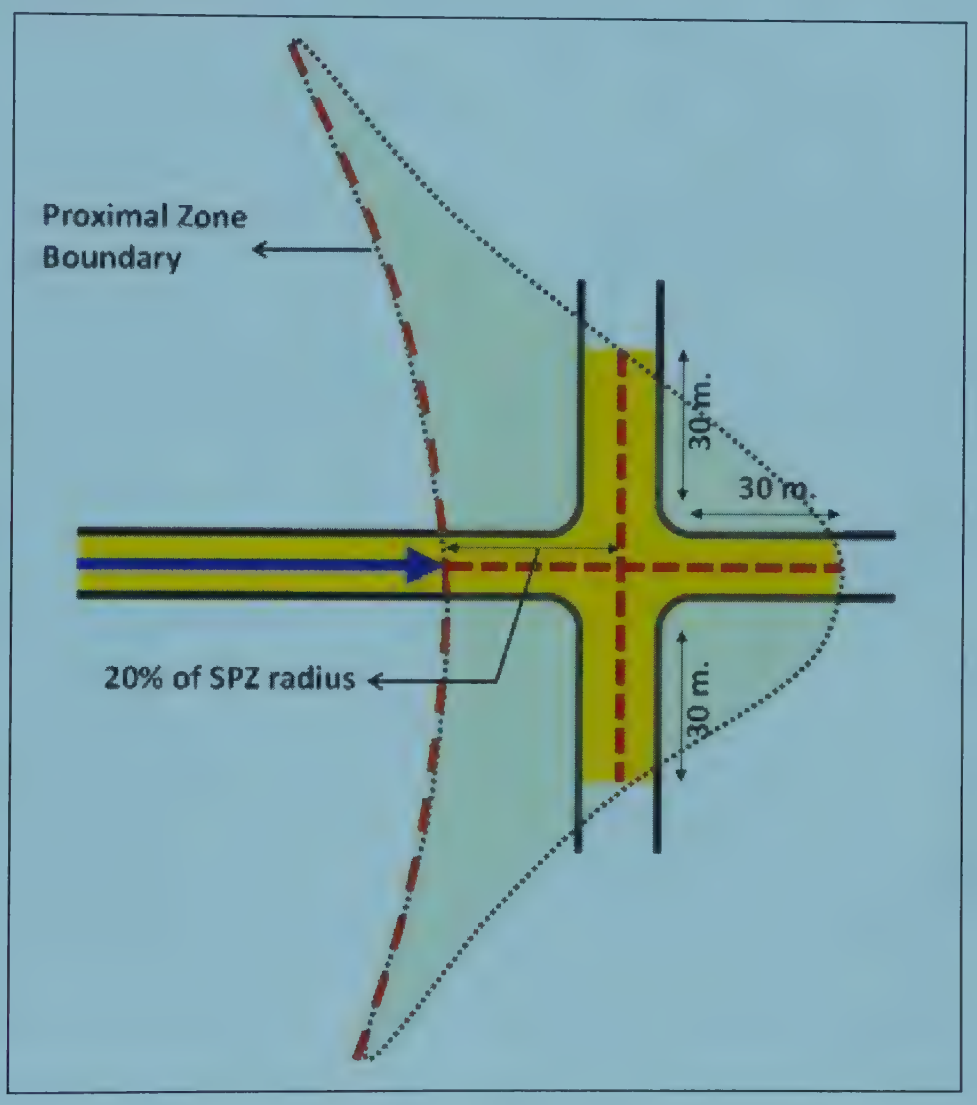


Fig. 2.4 Application of Special Conditions to Proximal Zone Boundaries

Table 2.2 Applicable Zone Radius Extension covering the various Functional Classification of Urban and Interurban Roads

Road Type	Primary (meters)	Secondary (meters)	Senior Secondary (meters)
Urban Roads / Interurban Roads	80	90	100
Arterial Roads / Highways	60	70	80
Collector Street / Other District Roads	40	50	60
Local Streets / Other Roads (including PMGSY Roads)	30	40	50

2.3 Transition Zone (TZ)

Transition Zone (TZ) may be understood as the predefined length of roads leading to a SPZ along which motorists should be made aware about the special nature of the approaching zone. Since the speed limits prescribed in the SPZ will be lower than the design speeds of different road classifications, TZ should provide motorists enough time and distance to reduce their speeds to the prescribed speed limits in SPZ (**Ref. Fig. 2.5**).

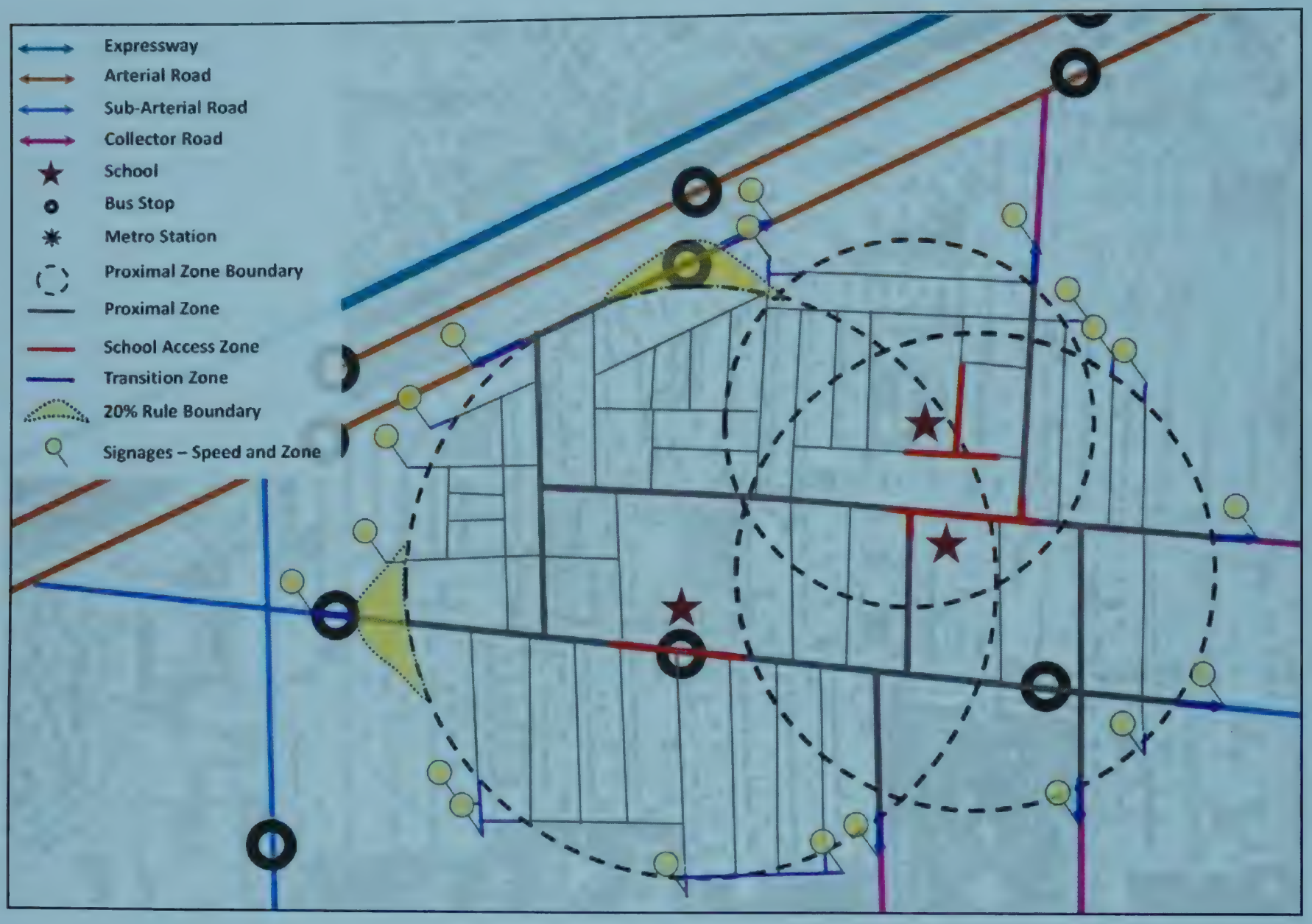


Fig. 2.5 Application of Transition Zones to School Proximal Zone

Table 2.3 elaborates on the length of transition zone length up to which the prescribed speed limits are applicable in the SPZ for different road classifications.

Table 2.3 Length of Transition Zones and Applicable Speed Limits in SPZ

Road Type	Design Speed as per IRC:86 (kmph)	Design Speed as per IRC:70 (kmph)	Prescribed Speed Limit in SPZ (kmph)	Length of Transition Zone (m)*
Urban Roads / Interurban Roads	60	80	30	70-75
Arterial Roads / Highways	60	80	30	45-50
Collector Street / Other District Roads	40	50	30	35-40
Local Streets/ Other Roads (including PMGSY Roads)	30	40	20	20-25

Note:

1. The design speeds for urban Roads/Street mentioned in the table are taken from IRC:86 and provided here for reference only. In the case of any discrepancy between the design speed values mentioned here and IRC:86, the values mentioned in IRC:86 shall prevail.

2. The design speeds for Interurban Roads mentioned in the table are taken from IRC:70 and provided here for reference only. In the case of any discrepancy between the design speed values mentioned here and IRC:70, the values mentioned in IRC:70 shall prevail.

**lower values will be considered for urban roads and higher values for Interurban Roads*

At the start of the transition zone various road signs like “School Zone Ahead”, “Speed Limit Sign’ signage shall be erected in the direction going towards the school zone. This signage should have supplementary plate mentioning the distance to the SPZ and Prescribed Speed Limit in the SPZ. Such provision would enable motorists for their transition into the applicable speed limits. Similarly, at the other edge of transition zone, where it overlaps with the SPZ, a “School Zone Starts” signage, along with the prescribed speed limit, shall be erected. Further, three sets of Transverse Bar Marking (TBM) with each set having 6 bars (conforming to IRC:35) measuring a thickness of 15 mm shall be provided on the main corridor to reduce the speed in the transition zone. Such treatment shall start from the edge of SPZ which would make motorists aware of their entry into a special zone. Further details have been furnished in **Annexure III**. TZ needs to be designated only in the direction leading to the SPZ. Further, at entrance point to the school, Speed Table shall be provided coupled with the provision of Speed Limit Sign erected at about 30 m before the entrance gate to the school and thereby facilitating safe crossing for the school children. When the SPZ ends, ‘Restriction End’ Sign (as per IRC:67) shall be erected which would help to communicate the end of special zone.

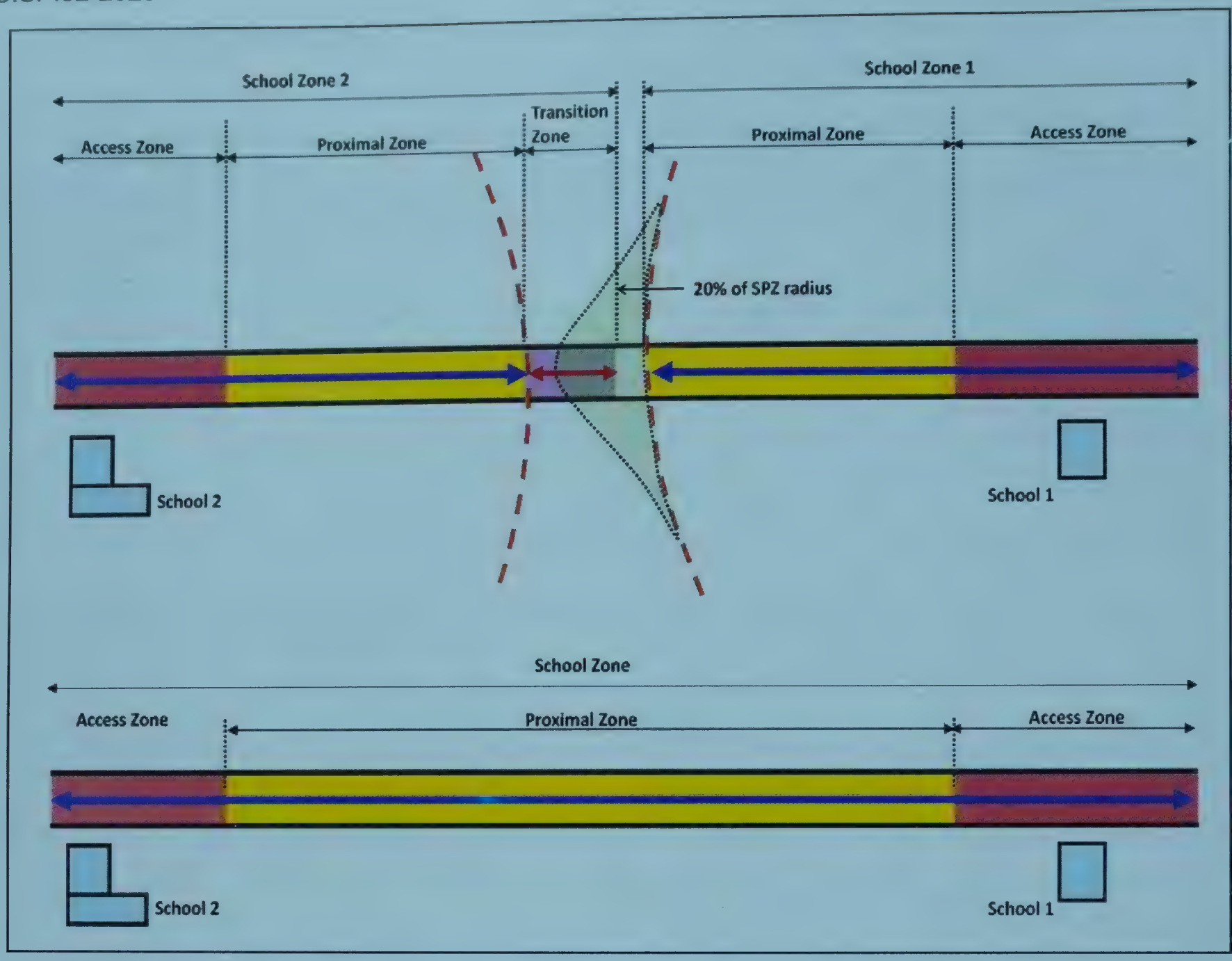


Fig. 2.6 Special Conditions if two Schools are located next to each other

In case TZ of a school falls within 20% of the SPZ radius of another school, then the stretch of road between the SPZs of both schools, shall also become part of SPZ (**Ref. Fig. 2.6**).

3. PRINCIPLES FOR SAFER SCHOOL ZONE DESIGN

As shown in **Fig. 3.1**, once the school zones have been identified, the design language and interventions shall be based on the following principles:

Simplify: Over-burdening children and motorists with excessive information and design elements can be counterproductive. Distraction may be dangerous for both children and motorists. This approach, thus, entails reduction of elements on the road itself.

Shield: This approach entails distancing children from potential harm. Crash barriers, and reduction of conflict points are some examples of protecting children from the various forms of potential harm.

Cushion: Since children lack adequate internal protection for their vital organs, there should be some interventions to reduce the severity of a possible crash. Reduced vehicular speed and softer paving materials are a few examples of this principle.

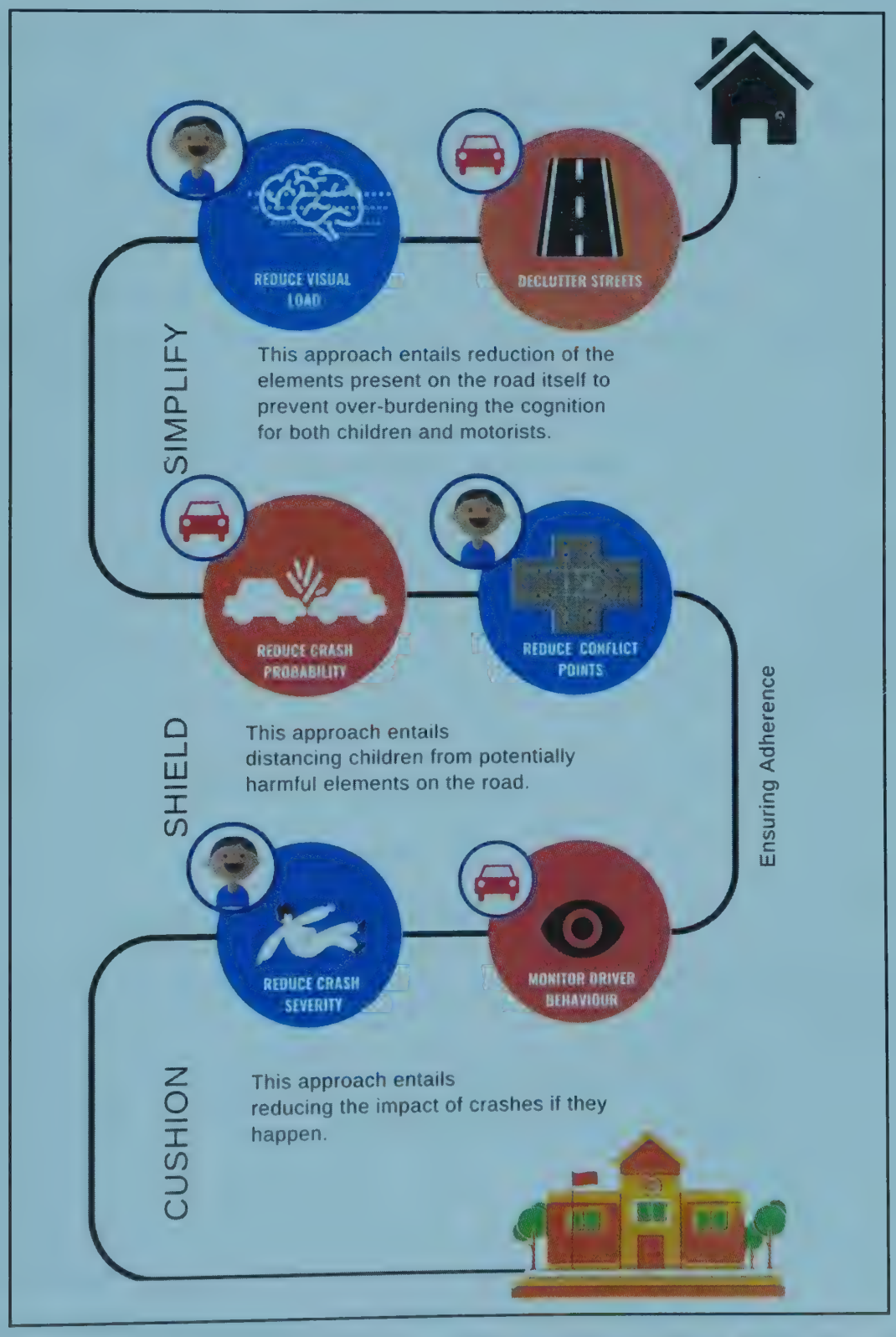

REDUCE VISUAL LOAD
DECLUTTER STREETS
SIMPLIFY
This approach entails reduction of the elements present on the road itself to prevent over-burdening the cognition for both children and motorists.
REDUCE CRASH PROBABILITY
REDUCE CONFLICT POINTS
SHIELD
This approach entails distancing children from potentially harmful elements on the road.
REDUCE CRASH SEVERITY
MONITOR DRIVER BEHAVIOUR
CUSHION
This approach entails reducing the impact of crashes if they happen.
Ensuring Adherence

Fig. 3.1 Design Principles for Safer Commute to Schools

4. STAKEHOLDERS FOR SAFER SCHOOL ZONES

In India, students' commute to school involves variety of modes i.e. bus, metro, shared van shared auto, electric rickshaw, cycle rickshaw, bicycle, drop off by cars and motorized two wheelers and walking. It is important to ensure children's safety for all the modes. This document provides safety measure for all these modes. Largely, parents and caregivers who walk or cycle must be given higher priority compared to the others commuting by cars and motorized two wheelers. All four stakeholders have their role in improving the road safety for children at every segment of their trips including boarding and alighting as well as picking up and dropping of zones. This manual also includes guidelines regarding training and sensitization for the gender safety while commuting. This document suggests framing a school zone level committee for ensuring safety of school children. This committee comprises the member(s) from each agency involved directly/indirectly as shown in **Fig. 4.1**.

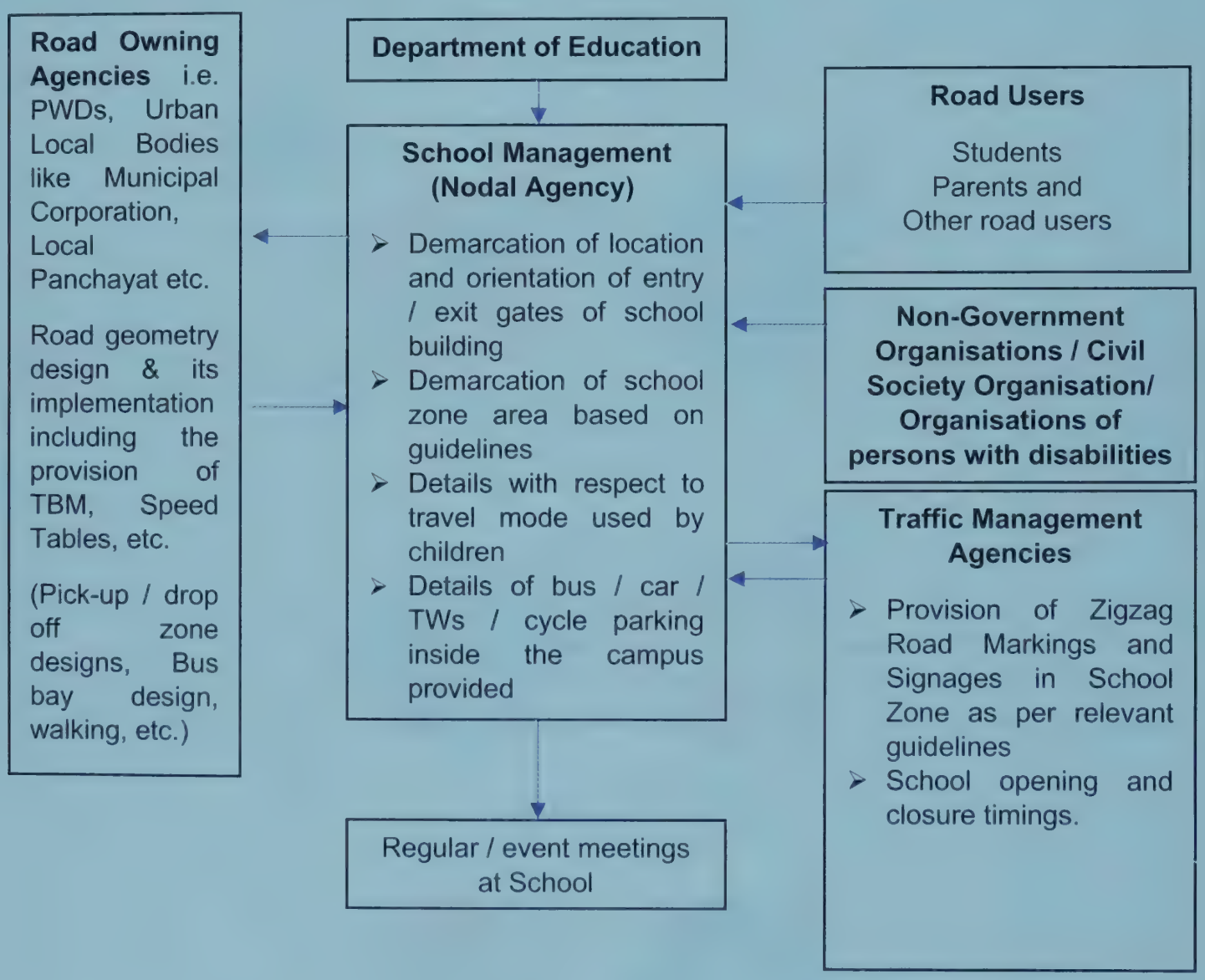

Road Owning Agencies i.e. PWDs, Urban Local Bodies like Municipal Corporation, Local Panchayat etc.
Road geometry design & its implementation including the provision of TBM, Speed Tables, etc.
(Pick-up / drop off zone designs, Bus bay design, walking, etc.)
Department of Education
School Management (Nodal Agency)
Demarcation of location and orientation of entry / exit gates of school building
Demarcation of school zone area based on guidelines
Details with respect to travel mode used by children
Details of bus / car / TWs / cycle parking inside the campus provided
Regular / event meetings at School
Road Users
Students
Parents and
Other road users
Non-Government Organisations / Civil Society Organisation/ Organisations of persons with disabilities
Traffic Management Agencies
Provision of Zigzag Road Markings and Signages in School Zone as per relevant guidelines
School opening and closure timings.

Fig. 4.1 Formation of Committee for Safe Commuting within School Zone

Apart from school children, any road user passing through the school zone area should be able to submit his/her concern with respect to traffic safety in this area. Schools should be the point of contact for school zone area. Depending on the type of concern, school representative can inform to all other committee members for taking the corrective action. This team shall meet regularly to address the concern of all road users. This is further to be supported by visual inspection scheduled by the school representative. During any School special event(s), i.e. Parent Teachers Meetings (PTMs), Annual Day celebration, etc. additional traffic / parking requirements need to be planned by school administration to ensure safety as well as uninterrupted traffic flow

This should be done in consultation with local traffic police. School administration is required to prepare and annually share a detailed document with key stakeholders. This document covers details with respect to traffic generated by school covering the following aspects:

Information with respect to school opening / closing timings for different wings.

Mode of commute for students

Parking facilities inside the school

Pick-up / drop off facilities, if any

Orientation of school entry / exit gates

Special events related information

5. ROAD ENGINEERING AND TRAFFIC MANAGEMENT ELEMENTS

This section provides guidelines for the provision of different road elements required for improving the safety of children in the school zones

5.1 Speed Management in School Zones

Vehicular speeds have a positive correlation with higher probability of crashes and fatalities. Studies have shown that fatality risks increase steeply when the Vehicular Speeds go beyond 30 kmph as shown in **Fig. 5.1**. It would also be seen that the chances of any fatality occurring is minimal for Vehicular Speeds 20 - 25 km/hr and thus Vehicle users can generally co-exist with pedestrians up to such speeds.

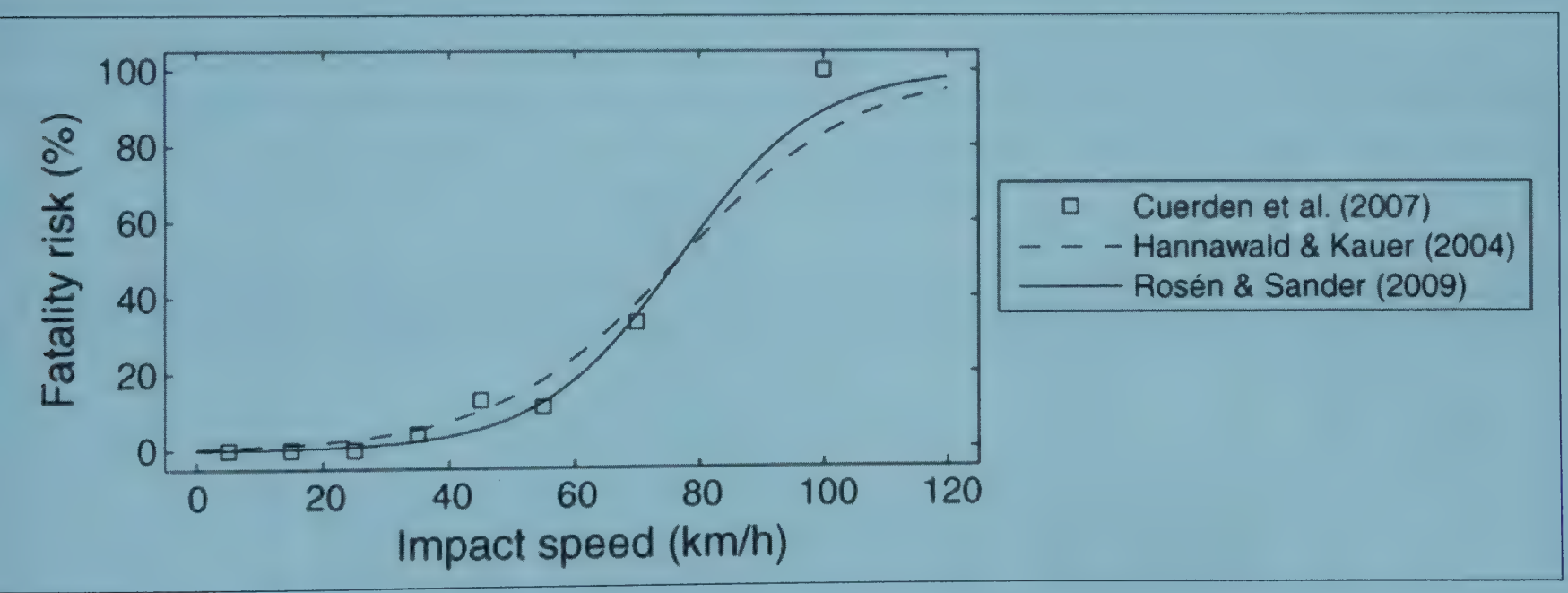


Fig. 5.1 Graph showing relationship between Vehicular Speed and Road Fatality Risk

Speed management within the school zone thus becomes important to reduce the severity of potential crashes. There are two ways in which speeds may be limited in a school zone:

- Enforcing fixed speed limits
- Enforcing time specific speed limits

Table 5.1 provides values for the prescribed vehicular speeds within school zones along with the preferred method for enforcing them.

Table 5.1 Prescribed Speed Limits and Methods of Enforcement in School Zones

Road Type	Prescribed Speed Limit (Kmph)		Preferred method for enforcing speed limits
	SAZ	SPZ	
Urban Roads /Interurban Roads	25	30	Time specific Speed Limit
Arterial Roads / Highways	25	30	Time specific Speed Limit
Collector Street / Other District Roads	25	30	Fixed Speed Limit throughout
Local Streets / Other Roads (including PMGSY Roads)	20	20	Fixed Speed Limit throughout

For schools having an entrance gate on service roads of an urban expressway, and if motorized vehicles are allowed on such roads, then the service road shall be treated at par with sub-arterial road for the purpose deciding on the size of the SPZ. The applicable speed limits for sub-arterial shall be communicated to motorists through the provision of appropriate signage and road markings.

5.2 School Entry/Exit Gate

A school's entry gate is one location where nearly all its students will congregate at least twice in a day. As such, it is pertinent to implement the strictest design and enforcement interventions for making children safe. The key principle, thus, shall be to ensure children are not directly exposed to vehicular traffic as they enter / exit the school gate. It is preferred not to have school entry/exit gate opening on any major roads like NH / SH / arterial and instead the opening can be provided on the Service Road. Further, these Service Roads should not be opening directly onto the intersection which would help to enhance the safety of the children. In case an opening cannot be avoided on a major road, then the traffic speed needs to be brought down on either side of the entry / exit gate (as mentioned in **Table 5.1** the speed limits for School Access Zone). Such speed reduction can be ensured through the provision of traffic calming measures like speed breakers, raised crossings, narrowing of the road width coupled with provision of relevant road signs and markings. A few typical templates are presented in **Fig. 5.2** to **Fig. 5.6**.

Fig. 5.2 Typical Illustration of various measures required for the School Gate located on Midblock Section of a Four Lane Divided Road

Note: x' = minimum 0.6 V meters apart from each other (where V is the Design Speed in km/h)

d = distance from intersection, as per IRC:67.

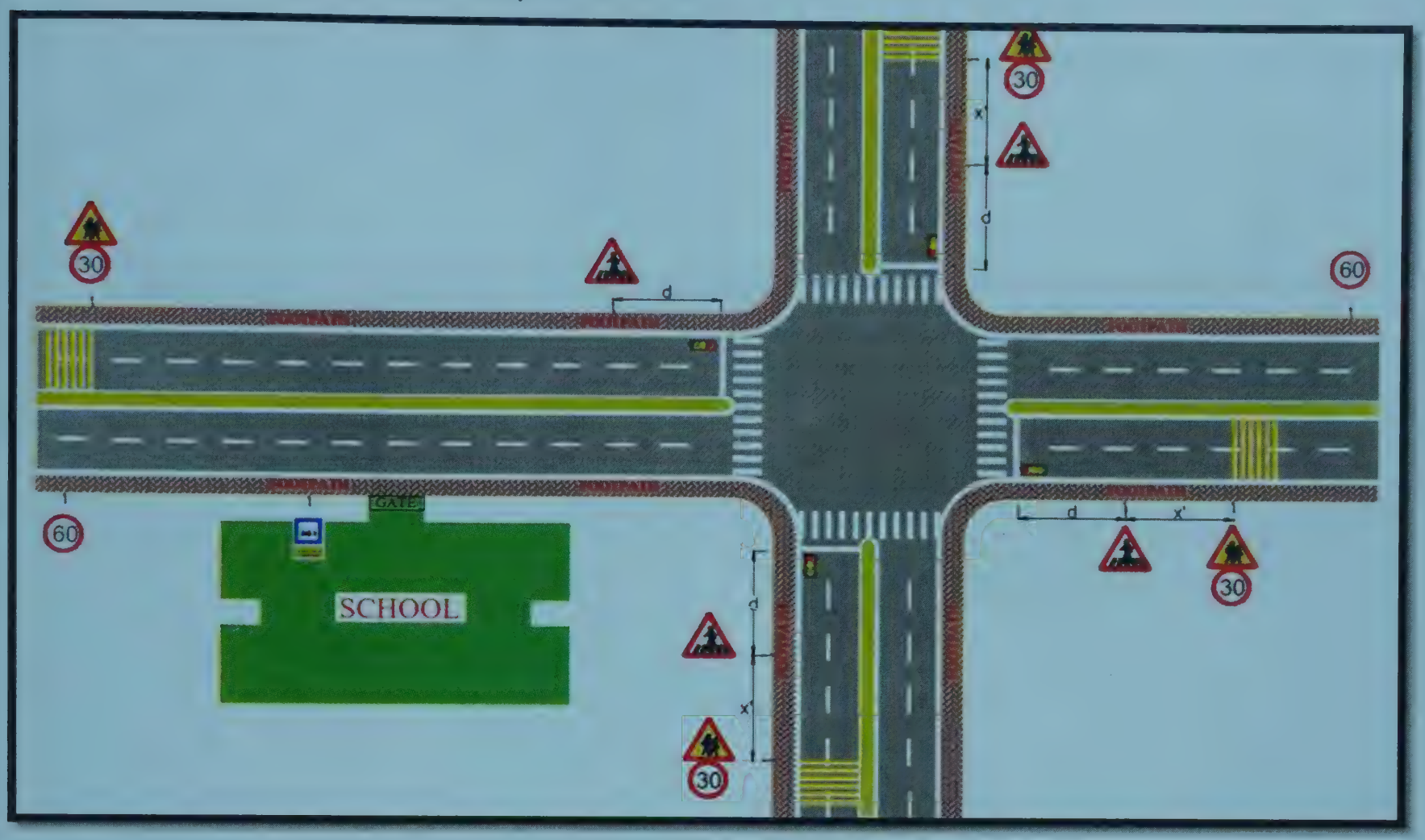


Fig. 5.3 Typical Illustration of various measures required for the School Gate located adjacent to a Major Intersection on Four Lane Divided Road

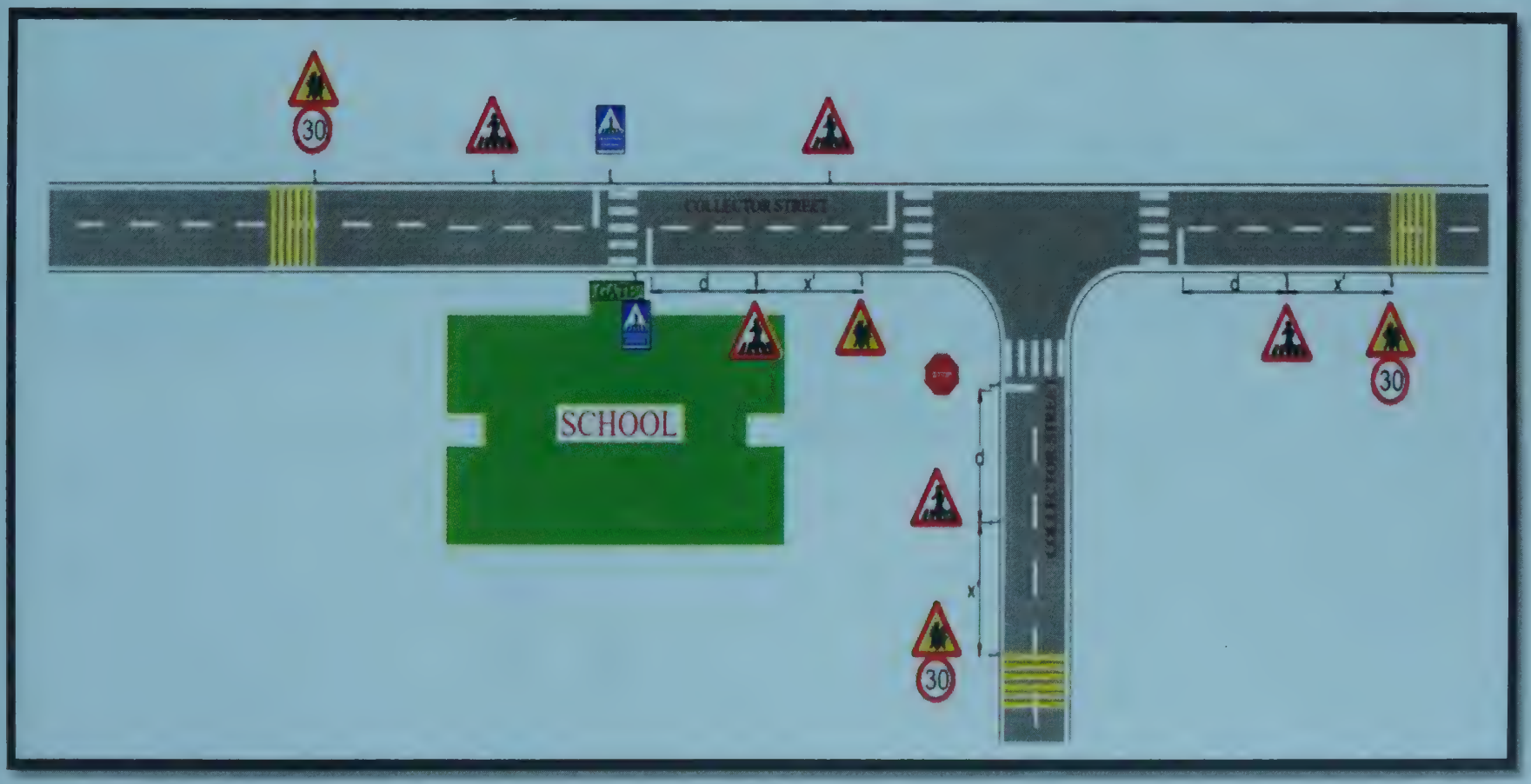


Fig. 5.4 Typical Illustration of various measures required for the School Gate located on the Midblock Location of Two Lane Bidirectional Road

Fig. 5.5 Typical Illustration of various measures required for the School Gate located on the Intersection of a Four Lane Divided Carriageway

Fig. 5.6 Typical Illustration of various measures required for the School Gate located on the Intersection of a Two Lane Bidirectional Carriageway

The specific provisions expected at school gates are as follows (**Ref. Fig. 5.7**):

(i) Segregation of gates for vehicular and pedestrian traffic.

(ii) Paved waiting area with seating and space for mobility aid users such as wheelchairs shall be provided near the entrance gates.

(iii) It shall be ensured that school entrance gates (for new schools) do not open directly on to the footpath.

(iv) The width and other characteristics of footpath should conform to values mentioned in IRC:103 for institutional areas.

(v) For entrance gates with cattle trap, 1000 mm wide strip / bridge plate should be used for its efficient functioning.

Fig. 5.7 School Entrance showing Cattle Trap and Access for Mobility Aid Users

(vi) The footpath surface should be well-maintained and free from any undulations.

(vii) To avoid conflict points near entrance gates, gap in median and service road openings, shall not be provided within 50 m from either side of the entrance gate. Vehicular traffic should be discouraged to halt or park in the SAZ, especially the stretch in front of the entrance gates, unless there is a space designated to do so. Such parking restriction shall be marked by posting appropriate signage as per IRC:67.

Fig. 5.8 Vehicular and Pedestrian Movement around Schools Gates

5.3 Pick & Drop off Areas

Pick up & Drop off facilities **(Fig. 5.8)** shall include provisions for school bus and private modes. Private modes shall include (shared) auto rickshaws, vans, cycle rickshaws, private four and two-wheelers, etc. The following design considerations shall be followed in the case of pick and drop areas for both school bus and private modes:

- As far as possible, pick & drop areas should be encouraged within the school premises itself to reduce safety risk for children and avoid traffic congestion near entrance gates.
- The kerb height, from where children will board/alight, shall not be more than 150 mm and shall have a kerb ramp.
- They should have provisions for universal accessibility as elaborated in IRC:SP:117 and IRC:103.
- Wherever exclusive gates are not available for vehicular and pedestrian's entry to school, traffic cones or other forms of channelizing devices should be used to minimize pedestrian/ vehicles conflicts and manage traffic flow. Mode-specific considerations for pick up and drop off areas are given in subsequent sections.

5.3.1 *Pick & Drop or Alighting and Boarding Zones for School Bus*

- Pick up & Drop off areas should not allow for reverse movement of buses.
- At the designated locations for bus drop off areas, the kerb height shall not be more than 150 mm. Also there should be kerbed ramp from where children will board / alight.
- There shall be a signage for pick/drop and shall be strategically located.

Fig. 5.9 Children boarding the School Bus from the left side

- Pick & drop areas should be designed for one-way clockwise direction to ensure students board/de-board the bus from the left-side kerb **(Fig. 5.9)**. This will ensure children are never required to walk between buses.
- In the case of inadequate space for bus pick & drop near the entrance gate, the same shall be provisioned further from the entrance gate, but within the SAZ.
- Each parking bay for a full-size bus should be a minimum of 4.0 m wide.
- Crosswalks should be avoided at entry to and exit from bus pick up & drop off areas.
- 'Bus Only' signage conforming to IRC:67 shall be provided at the start of bus pick & drop areas.
- Details about the road signage and markings have been furnished in **Annexure II**.

5.3.2 *Pick & Drop or Alighting and Boarding Zones for Private Modes*

At school, it is most preferred to have pick-up/ drop-off zone inside the school campus especially for all children under the age group of 7 years. In such cases, a separate entry/exit for pedestrians is required to be provided to avoid conflict with all other vehicles. In case of space unavailability, multiple zones for pick-up/drop-off needs to be identified by school management. This area needs to be demarcated with signages/markings. This marking is required even if pick-up/ drop-off area is part of parking area. If location and circulation permit, moving of through traffic can be blocked for certain hours during the school opening and closing hours and the space can be provided to buses/autos/para transit and cars for people with disabilities. School should deploy marshals during school opening/ closing hours to support traffic management and safety within school zone.

Pick-up and drop-off areas for private modes including Intermediate Public Transit (IPT) (i.e. rickshaw) as well is a must as the latter is used for ferrying children to/from school. Normally these IPT modes are facilitated by the parents/guardians of the students, but not the school

administration. Wherever possible, such facility should be provided within the school premises to reduce safety risk for children and avoid traffic congestion on roads. In situations where in-campus pick up and drop off up areas for private modes is not possible, on-street facilities shall be ensured as per the following.

- Pick & drop facilities shall be situated at least 20 m away from either side of school entrance gates. This is to avoid any sort of crowding at the gate and helps in distributing the load away from the school gates. It would also improve the visibility of the driver while approaching the school gate thereby improving the safety (**Ref. Fig. 5.10**)

Fig. 5.10 Design of Accessible Pickup and Drop Off Bay

- Accessible parking/pick & drop bay for wheelchair users should be provided closest to the school. Design of the bay should conform to IRC:103.
- The pickup/drop-off area should have clear minimum walking space of 2 m for pedestrians.
- The length of drop-off areas should be a minimum of 2 Equivalent Car Space (ECS) and a maximum of 4 ECS with a 45-degree flange, for easy manoeuvring.
- Pick up and drop off bays around the school should be numbered. Each bay can be assigned to a group of classes by the school to distribute the load of vehicles during the opening and closing hours.
- Details about the road signages and markings for accessible parking bays have been furnished in **Annexure II**.

Fig. 5.11 Pick and Drop Facility for Private Vehicles (The kerb stone is deterrent for children with disabilities)

- The pick and drop area closest to a school entrance gate shall be made wheelchair friendly, complete with all provisions outlined in IRC:SP:117 (**Ref. Fig. 5.11**).
- It shall be ensured that the drop-off zones are never used for parking.
- In the case pick-up and drop-off of students takes place across the street, then the schools shall deploy staff or other safety patrols, who shall help students cross the roads safely.

5.4 Walking Infrastructure

5.4.1 *Footpath*

For collector roads and above, raised footpath shall be provided on both sides of the carriageway, as per dimensions and specifications mentioned in IRC:103.

The pavement material for the footpaths shall conform to IRC:103. However, owing to children's higher susceptibility to injury, softer materials should also be explored.

All provisions for universal accessibility shall be incorporated as per IRC:SP:117 and IRC:103.

- The kerbside of the footpath in SAZ shall be provided with guard rails as per details mentioned in the succeeding section.

Fig. 5.12 presents an example of Pedestrian Facility.

Fig. 5.12 Pedestrian Facility

5.4.2 Guard Rail

Guard rails are an essential design element for school zones, especially around primary schools. Younger children (5-7 years old) are often more unpredictable as they tend to run on to the roads. To address their concerns, the following features are essential: (**Ref. Fig. 5.13**).

Fig. 5.13 Guard Rails and Organisation of Pedestrian Space

Since projected cycle wheels are a potential accident hazard to children/adults with visual impairment, as shown in **(Fig. 5.13)**, Walkway shall show tactile paver 600 mm away from the cycle wheel.

There shall be a continuous guard rail provided between the school entrance gate and the first pedestrian crossing on either side of the entrance gate.

As such, IRC:103 discourage continuous guard rails of more than 20 m under normal circumstances. However, in school zones, due to the presence of children guard rails shall be permitted to extend up to 50 m, if required.

- Guard rails shall not be discontinued in front of pedestrian only gates. Discontinuity shall be permissible only for entrance gates with vehicular access.
- The guard rails should be between 700 mm to 1000 mm high.
- Anti-scaling guard rails shall be preferred to discourage students from jumping over.
- It should be ensured that guard rails do not have sharp edges to protect children with visual impairment.

At the same time, in the case of slightly older children, (8-10 years of age), warrant a different design intervention as children of that age tend to venture out independently. To address the above issue, it is imperative to minimize visual obstruction. Similarly, students in middle school, secondary school and senior secondary school should have minimum visual obstruction.

5.4.3 *Pedestrian Crossings*

All pedestrian crossing facilities shall conform to IRC:103, unless specified otherwise in this subsection. These facilities should also ensure conformity to IRC:SP:117 (**Ref. Fig. 5.14**).

Fig. 5.14 Intersection falling within a School Zone

- Wherever possible, the crosswalks should be at right angles to the carriageway and properly marked so that the pedestrian is subjected to minimum inconvenience.
- Adequate visibility, freedom from obstruction and sufficient space for waiting are the important requirements for at-grade crosswalks.
- Table-top crossings (also called raised crosswalks) shall be the preferred design for crossings in school zones, as it brings the motorists and pedestrians at the same eye level. This is especially important for the safety of children.
- As both a marked crosswalk and a traffic calming element, table-top crossings provide a superior safety advantage to pedestrians.

- Table-top crossings shall be installed within 20 m of school entrance gates, to slow down vehicular traffic and allow students to cross to the other side. (Details have been furnished in **Fig. 5.15**.
- Wherever table-top crossings are not possible and crossings at the same level of the road are provided, kerb ramps, bollards, etc. shall be provided as elaborated in IRC:103.
- Foot-over bridges equipped with lift facility shall be permitted in unusual circumstances for the schools located directly on arterial roads only conforming to IRC:103.
- To make information clear and accessible to children, pedestrian crossing signage should also be stamped on the footpath.
- 'Look Left/Look Right' text should be painted on the carriageway and audio beepers shall be provided in the signals to inform the children with and without disabilities on looking out for vehicular traffic before crossing the carriageway.

Fig. 5.15 Table-Top Crossing

In summary, the installation of relevant road signs, zigzag markings, traffic signals, and erection of traffic calming measures etc. for the designated pedestrian crossings conforming to the relevant IRC guidelines referred in this document is a must.

5.4.4 *Pedestrian Refuge Islands*

Refuge islands provide a place of safety for pedestrians while crossing wide streets which, ordinarily, they could not have crossed in one go due to factors such as speed of the pedestrian, number of lanes, signal timings etc. A typical use of the refuge is to provide a safe space for pedestrians to wait while crossing a street.

Fig. 5.16 Refuge Island with safe gap for Pedestrians

Pedestrian refuge islands shall be provided at every instance in the school zone, as per the guidelines provided below (also Ref **Fig. 5.16**).

- Pedestrian refuge islands for crosswalks should not have raised kerb and should not be less than 1.5 meters in width and 3.6 meters in length. Openings or dropped kerbs should be provided in the centre island to allow for universal accessibility.
- Pedestrian Refuge Island should be properly highlighted with the help of road markings and road furniture like signage, median markers or normal or solar studs based on the site requirement. This will help to warn the motorised vehicle users about the presence of pedestrians crossing.
- Standalone refuge islands can be provided in streets that measure 12 meters or below in ROW and generally do not have medians. The width of such islands can be restricted to 1.2 m.
- On depressed refuge islands as well as on footpaths, Concrete Bollards or Flexible Retro Reflective Bollards (having two numbers of white retro reflective sheeting of 100 mm width of Type IV grade pasted on them) must be fixed at each end so that vehicles are forewarned of the impending obstruction on the road during the night.
- Zebra crossing marking must be provided at such refuge island across the road.
- The refuge island should be invariably painted with red and white stripes as detailed in the section on road marking.

- Streetlights (white colour is recommended) are to be provided to make the pedestrian crossings not only visible but also to have a psychological effect on motorists about something important. It automatically commands respect from motorists because pedestrians would be visible even from a good distance. The specifications of each signage are given in **Annexure II** which is basically taken from IRC: 67.

5.5 Cycling Infrastructure

Cycling infrastructure when provided on a road has no value unless it is planned at a network level. Most short trips in urban areas are either covered on foot or by cycle including tri-cycles. A good cycling infrastructure thus encourages more cycling, which in turn has numerous social benefits attached to it. When provided, cycling infrastructure in school zone shall be provisioned keeping in mind the guidelines elaborated in the subsequent subsections.

5.5.1 *Cycle Track and Cycle Lane*

There are two ways of designating space for cyclists in the public right of way. When there is a level difference between space designated for cycling and other road users, it is called a cycle track. However, when a lane in the carriageway is designated for cycling, without any level difference, but with or without segregators/delineators, the space designated for cycling is termed as a cycle lane. The following aspects shall be kept in mind while provisioning the cycle track (**Ref. Figs. 5.17** and **5.18**).

Fig. 5.17 Cycle Track in Delhi

Fig. 5.18 Pop-up Cycle Lane in Chennai

- In the case of urban roads, arterial and sub-arterial roads shall have adequate space for cycle track in the ROW.
- Single direction cycle tracks shall have a minimum clear width of 2 m, and bi-directional cycle tracks shall have a minimum clear width of 3 m.
- When cycle tracks are located adjacent to footpath, the guardrail to be erected at the kerb-side edge of footpath, shall be repositioned to the kerb-side edge of cycle track.
- While cycle tracks are preferred in other roads as well, the provision of cycle lanes may be considered only when there is not enough space to accommodate a track. In such cases, the roads must be installed with traffic calming measures to make sure that the cyclists and other vehicles can travel at safe speeds.
- The surface of cycle tracks and lanes shall be clearly painted in green as per IRC:35.
- Appropriate signage as per IRC:67 shall be erected for information to users.

5.5.2 *Cycle Parking*

Cycle parking should be provided inside the school premises. Wherever this is not possible parking racks should be installed either by the school authority or the concerned civic authority along the compound wall of the school to allow for safe and secure parking (**Ref Fig. 5.19**).

Fig. 5.19 Racks for Stacking and Parking Bicycles

Cycle parking should not encroach onto the walking space of pedestrians. In cases where adequate walking space is not available, vehicular parking should be replaced with cycle parking and such parking shall be provided free of cost. Semi vertical and stacked racks can be provided at schools with high parking demand and space constraints. To encourage cycling among students and staff, the number of parking bays should be 20% more than the number of people cycling to the school.

5.6 Public Transit Stops Within School Zone

- To make sure the bus stops are accessible by children, height of the flooring of the bus stop should not be more than 150 mm (**Ref. Fig. 5.20**).
- The design of stops should be such that it does not obstruct visibility of surroundings and pedestrian flow on footpath.
- The height of the seating should be less than that of the rest. Space for wheelchair to park should be made at all bus shelters.
- The design should be compact, robust with anti-skid, levelled floor space and with preferably cantilever roof, sufficient shade, and light.
- Advertisements should not obstruct route information display maps, statutory signage etc Back panel should not be opaque, and Advertisements should be placed in such a way that they do not block the vision for pedestrians.

Fig. 5.20 Public Transit Stops falling within a School Zone

5.7 Road Markings

Road markings have been an effective way of conveying contextual information to motorists without diverting their attention from the road. Similarly, road markings can play a very important role in school zones, especially when there is a need to convey information to drivers while entering a school zone. Road markings in school zones shall adhere to IRC:35, except for the following:

- For all objects within the carriageway, that was supposed to be painted as alternate black and yellow/black and white stripes (horizontal, vertical or sloped) as per IRC:35 shall be painted as alternating red and white stripes in the school zone with 3D impression to be easily detected by white can users i.e. persons with visual impairments. All other conditions, dimensions, warrants, etc. defined in IRC:35 shall remain the same, except that the black and yellow / black and white colours should be replaced by red and white colours.

- For sections where some specific restrictions are enforced and were supposed to be yellow painted kerb as per IRC:35 shall be painted red. All other conditions, dimensions, warrants, etc. defined in IRC:35 shall remain the same except that the yellow colour should be replaced by red colour.

- As per IRC:35, pedestrian crossing (BM01/BM02/BM03) is painted as alternate white and black of 500 mm width each. The black, however, is the unpainted surface of the tar road and in the case of school zones; it shall be painted in red colour, instead. An additional 250 mm wide border in red colour shall be painted on either side of the pedestrian crossing, perpendicular to the direction of travel (**Ref. Fig. 5.21**) for details.

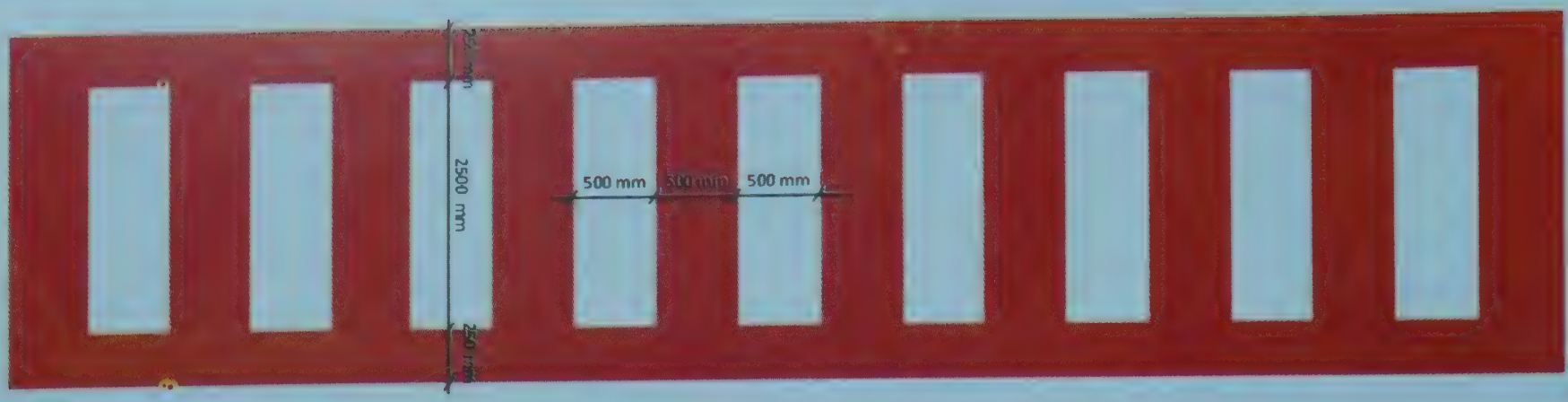


Fig. 5.21 Pedestrian Crossing for School Zones in 3D Tactile Impression

- For table-top pedestrian crossings in SAZ, colourful patterns are encouraged over traditiona alternate white stripes. This is done to make the crossing more attractive for pedestrians especially children to use, as they are attracted to bright colours and patterns. A typica example is shown in **Fig. 5.22**.

- All pedestrian crossings in the school zone shall have "Look Left" or "Look Right" painted a start of the crossing. Graphic pavement marking on cycle track shall be marked in differen colour as shown in **Fig. 5.22**. Recommended product details are mentioned in **Annexure II**.

Fig. 5.22 Pedestrian Path and Pedestrian Crossing Area

- As per IRC:35, speed breakers (BM05) are to be painted in a black and white cheque block pattern. However, in the case of speed breakers provided in school zones, the black colour shall be replaced by red colour, and all other conditions, warrants, specifications, etc mentioned in IRC:35 shall prevail. The same shall also be done for the sloped sections o table-top pedestrian crossings in school zones.

- In the SAZ, the speed limit signs, applicable for that stretch of road, shall be replicated onto the carriageway in the form of road marking for increased adherence. Such speed limit shal be painted in an elongated manner.

- In transition zones, zig-zag markings can be used to alert the motorists of the pedestrian crossing to ensure that they do not stop before the crossing but begin to slow down.

These deviations from IRC:35, for road markings in a school zone are done to create a uniform identity and highlight the special nature of school zones. All warrants, dimensions, conditions paint specifications, quality, durability, testing, etc. for road markings shall be as per IRC:35

except for the colour of paint suggested to be changed. Further, the other road markings as warranted by IRC:35 shall be provided in the school zones. Apart from the above, school zones shall put graphic pavement marking to use as well.

5.8 Signages

All signage in school zones shall conform to IRC:67. However, there are few signage that shall have special warrants in the school zone, as explained below:

- At the edge of the transition zone, a "School Zone Ahead" signage shall be erected in the direction going towards the school zone. This signage should also mention the distance to the SPZ and prescribed speed limits in the SPZ to enable motorists for doing the transition into the applicable speed limits (**Ref. Fig. 5.23**).

Fig. 5.23 Transition Zone, with the necessary information for Motorists

- At the other edge of transition zone, where it overlaps with the SPZ, a "School Zone Starts" signage, along with the prescribed speed limit on that road, shall be erected.
- The background of "School Zone Ahead", "School Zone Starts" and "School Ahead" signs shall be fluorescent yellow-green colour.
- At the point where SPZ ends, "Restrictions End" signage shall be erected in the direction moving away from the school.
- In case there is a difference between prescribed speed limits in SAZ and SPZ, a sign may be erected at the edge of SAZ/SPZ, informing the motorists about the change in speed limits.
- In case time-specific speed limits are enforced then speed limit signs shall be provisioned with supplementary boards mentioning the timings and corresponding speeds for that stretch.

5.9 Signals and Beacons

Traffic signals in school zones (**Fig. 5.24**) if provided shall conform to IRC:93 in all respects, except the following:

- Secondary traffic signals shall not be erected at any intersection in the school zone.
- Only the primary, shall be installed at the stop line, on the left side of approaching traffic, as detailed in IRC:93.

Fig. 5.24 Traffic Signals for Pedestrians and Motorists

- ITS, Traffic Signals as elaborated in Section 3.2.18 of IRC:SP:117, are encouraged to be adopted wherever possible.
- Pelican signals (**Ref. Fig. 5.24**) shall be installed for all directions of a pedestrian crossing. IRC:93 mentions about primary and secondary signal for regulating vehicular traffic. While there shall be no secondary for traffic signals, the concept shall be adopted for pelican signals. Thus, every pedestrian crossing shall have a primary and a secondary signal, for each direction of movement with audio announcement/beeper. Signal time should be calculated based on the walking speed of children and pedestrian traffic volume, this can be kept at least 20 - 25s (**Ref. Fig. 5.25**).

Fig. 5.25 Acoustical Signals for Safer Crossing/Pedestrian Crossing

This shall be done to ensure greater adherence to traffic signals by limiting motorists'

Flashing Yellow Beacons (**Ref. Fig 5.26**) are most effectively applied where drivers would not otherwise note school zone signage due to traffic conditions, speed of travel and competing signage. They shall be provided at the start of the SAZ and at all midblock pedestrian crossings in the SPZ, as per the following guidelines:

- The flashing lights should be timed to correspond to school arrival and dismissal times. The preferred timings for this purpose shall be from 30 minutes before to 15 minutes after the school entrance gate closes in the morning. Similarly, from 15 minutes before to 45 minutes after the school gate opens for departing students during the closing hours.
- Moreover, Flashing beacon programming should include the ability to make changes to the flash schedule to account for modifications under unforeseen circumstances i.e., foggy weather, accident ahead.
- Beacons should be installed at 50m intervals within the SAZ. The beacons can either be installed on both sides of the road on the footpath or on the median facing both directions. The operations of the beacon can be controlled by the school management after taking due permission from the enforcement authorities.
- Beacons shall be flashed at a rate of no less than 50 or more than 60 times per minute. The illuminated period of each flash may be a minimum of 1/2 and a maximum of 2/3 of the total cycle.

Fig. 5.26 Flashing Yellow Beacons

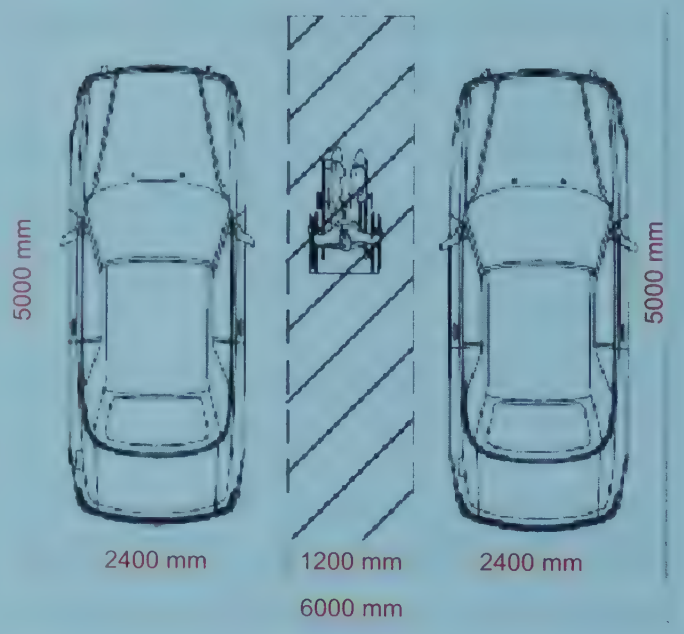
- To improve the visibility of the illuminated face of the warning beacon, fluorescent yellow coloured retro-reflective backing board may be provided.
- A speed limit sign beacon shall be used with a fixed or dynamic speed limit sign.

5.10 Parking

All on-street parking should be discouraged within SAZ, especially on the road adjacent to schools and especially during school hours. It shall be the responsibility of the SMCs to notify the local police about the school hours, for appropriate enforcement. Wherever provided, on-street parking shall adhere to the following:

- Double lane parking shall not be permitted anywhere in the school zones.
- Perpendicular and angular parking shall not be allowed within the SAZ.
- Supplementary boards for parking signage shall be provisioned as per IRC:67 to communicate the time-specific parking restrictions.
- Width of parallel parking bay shall not exceed 2m. The same space may also be used for perpendicular parking of two wheelers and cycles.
- Parking near bus stops and pedestrian crossings should be as per IRC:103.
- On streets where providing parking bays is not possible and vehicles are parked along the kerb on the carriageway, Zig Zag marking as per IRC:35 should be provided to indicate to drivers where there is No Parking, or No Standing allowed.
- Accessible parking for two cars and two adapted scooters shall be provided within 30m of the entry to school classroom blocks.
- Accessible parking for four wheeler parking area (**Ref. Fig. 5.27 (a) and (b)**)
- Accessible parking for adapted two wheeler/tricycles shall be provided in the two wheeler parking area (**Ref. Fig. 5.28 (a) and (b)**)

(a)



(b)

Fig. 5.27 Four Wheeler Parking Area

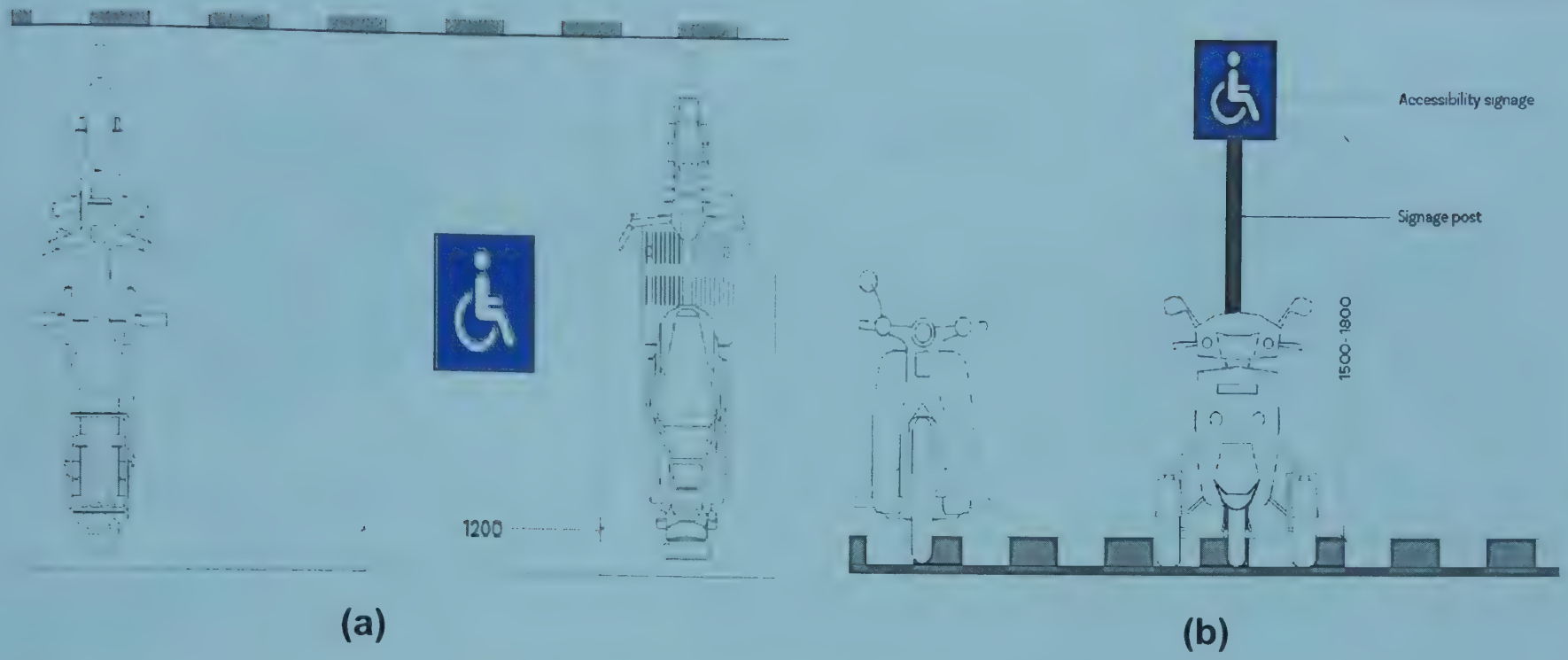


Fig. 5.28 Two Wheeler Parking Area

5.11 Street Vending

The Street Vendors (protection of livelihood and regulation of street vending) Act 2014 safeguards the rights of street vendors to occupy and use streets as platform for selling their goods. This makes street vendors an important part of street design. However, their presence might entail visual occlusion for children. Street vendors may only be allowed to do business in vending zones. These vending zones shall take the following into consideration:

- Vending zone should not occupy more than 2m wide space in the ROW without encroaching on the pedestrian zone of the footpath.
- To prevent crowding and congestion, vending should be allowed 50m away from pedestrian and vehicular gates of the school. The carts should be adequately spaced to avoid crowding.
- Consecutive vending zones shall be planned at least 50m away from each other in the SAZ.
- Consecutive vending zones shall be planned at least 30m away from each other in the SPZ.
- Public utilities such as water fountains and clean toilets shall be provisioned for the street vendors.

5.12 Demarcation of School Zones

The Right to Education Act of 2009 provides for the constitution of a School Management Committee (SMC) consisting of the elected representatives of the local authority, parents or guardians of children admitted in schools and residents within the SAC. SMC's may assist local authorities in delineation of school zones by providing information on number of students, number of students with disabilities, their entry/exit points, their mobility pattern in terms of mode of travel, commute distance, time, etc., their mobility challenges and aspirations and so on. Upon receiving the details, the local authorities shall be responsible for delineating and notifying the School Zones. Apart from assisting the local authorities in delineating school zones, the SMCs should maintain accessibility features, visual design scheme including wall-art, surface material, landscaping, etc (**Ref. Fig. 5.29**).

Fig. 5.29 View of various Road Signs and Zones in a School Zone

5.13 Passive Measures

The school zone should be able to make motor vehicle drivers cognizant of their speeds and, in turn, make sure that children are not exposed to high-risk zones.

Fig. 5.30 Graphic Language to be followed across the School Zone

School zones should be designed in a holistic manner and not patch-worked at specific locations. Transitioning into a school zone should be such that all road users become fully aware that they have entered a special zone (**Ref. Fig. 5.30**). To highlight its special nature, the following considerations shall be made:

For all objects markings that were supposed to be painted as alternate black and white or yellow and black stripes as per IRC:35, shall be painted as alternating red and white stripes. All other conditions, dimensions, warrants, etc. defined in IRC:35 for object markings shall remain same.

To emphasize the need for restricted speeds and make drivers aware of children crossing the roads, speed limit signs shall also be stamped/painted on the carriageway conforming to IRC:35.

- Boundary walls of properties in SAZ especially that of the school, should not be void of street art.
- Street art should be encouraged on boundary walls of all properties in the SPZ.

6. ARTWORK FOR SCHOOL ZONE

To all road users, especially to the vehicle users it is important to convey if they are entering to the school zone area. For this, it is required to have additional colours in this area in the form of artwork, signages, road markings and street furniture. This can be done on the exterior wall of school boundary, colourful and more attractive designs for zebra crossings, etc. Some guidelines considered marking school zone as 'Yellow Carpet Zone' to highlight the area for better concern of all road users. People in yellow-painted areas are more visible to drivers. They

were also proven to create a "nudge effect," motivating children to stay inside the yellow zone while waiting for a crossing sign and consequently reducing the chances of a risky crossing outside the crosswalks. (**Annexure II**) Use of different textures in road surface design can also be done with a combination of paving pattern and paint marking is represented through **Figs. 6.1 to 6.4**.

Fig. 6.1 School Ahead Pavement Marking (Case Study Location: Sydney)

Fig. 6.2 School Ahead Pavement Marking (Case Study Location: Singapore)

Fig. 6.3 School Ahead Pavement Marking (Case Study Location: USA)

Fig. 6.4 Yellow Carpet Road Marking to improve the visibility of School Children Crossing Area (Case Study Location: Korea)

7. TRAFFIC AND SAFETY LEARNING PARK AND PATROL TEAM

Schools are encouraged to take students to the nearest traffic learning parks and/or driving schools to teach traffic and safety aspects. Schools can also do so by creating a small traffic learning park inside the school as shown in **Fig. 7.1**.

Fig. 7.1 Traffic Learning Park inside the School

In schools with classes of 8 and above, Road Safety Patrol (RSP) teams comprising of students can be encouraged to manage the traffic outside the school premises. The team can be trained by the local police station on Road Safety and Traffic Management by taking them to local Road Safety Parks and/or Driving Schools. Creating RSP in the school will not only help in creating awareness on road safety issues among students, inculcate a sense of responsibility for safety of self and fellow students. This team along with teachers and school administration should consider imparting first aid training which in a way would inculcate role of bystander in the minds of the growing children and thus enable in the overall improvement of safety of all road users.

In case of space constraints, highest priority must be given to students commuting by sustainable modes and assistive devices (wheelchair, crutch users, etc.) i.e. walk, cycle, bus, etc. compared to students commuting by personalised vehicles. Parents/guardian of students commuting by personalised vehicles can stop their vehicle farther and do walk for some distance, in case needed.

8. PARENTS AND CHILDREN

For younger children (age less than 7 years), parents/guardian are advised to hold their hand while on road. For children older than 7 years, parents are advised to impart road safety education on road, in addition to pictures, books and other material at home. If a child is planning to commute alone by walk / bicycle, consider the safest route for home to school and back journey. Before making a start for sending a child alone, do dummy trips (practice trip) on the same route few times in the presence of an adult. In case of attendants/ parents of children with disabilities are not there, peer group support while boarding and alighting the vehicles, road crossings and waiting shall be ensured. School staff shall be deployed to ensure safe commute of children with disabilities younger than 7 years. Any safety hindrances can be reported to the School Management Committee so that missing infrastructure, signages and improvements in SPZ, SAZ can be improved. During the above dry runs, it is essential to show the complete route to the child and teach the nuances of using the road in a simple manner covering the following points:

- Stand in a safe place while you show the traffic to your child
- Show and explain about the two directional traffic
- Show all possible turning movements of vehicle at intersection
- Explain the traffic signal functioning
- Discuss about the limitations at un-signalised intersection/midblock
- Talk about the on-street parking and also about risk associated while vehicles are taking reverse movement
- Talk about the risk attached with vehicle types (big/small)
- Discuss the risk hazards associated with speed (slower/faster)
- Talk about road signs and explain what each signage means
- Talk about unexpected violations by others
- Make sure your child can follow 'Stop, Look, Listen and Think' procedure before initiating any crossing of roads.
- For children with disabilities: for assisted child, caregiver should be explained all the above; while those who are unassisted and are assistive device users, they should be encouraged to commute with other non-disabled children

While identifying safest route from home to school and back, consider the following:

- Prefer route with minimum number of intersections and crossings
- Prefer road with footpath/bicycle lane compared to without segregated walking/bicycling lane
- Avoid intersections with 'free left' turning or unsignalised

Parents are required to check following things **(Table 8.1)** while sending children to school by various modes:

Table 8.1 Checklist for Parents

Sr.No.	Mode	Checks
1	School Bus/Van	Does school have permit for operating school buses?
		Does school have all documents for bus driver and accompanying assistant
		Is a dedicated and demarcated pick up and drop off zone inside/adjacent to school
		Is the school management maintaining periodical check-ups for buses and drivers?
2	Private Van/ Shared Auto	School operated/private van must have all required document for vehicle and driver
		Seat belts must be checked for every single trip
		Vehicles with Air bags are encouraged
		Keep your concern for the traffic violations by the driver
		Do not allow overloading
3	Bicycle	Use helmets and retro reflective jackets for the rider
4	Walk	To See and To Be seen
		Do not do texting on mobile while walking

(i) Teach your child the 'STOP! LOOK! LISTEN! THINK!' routine every time you cross the road together:

- **STOP!** One step back from the kerb.
- **LOOK!** For traffic to your right, left and right again.
- **LISTEN!** For the sounds of approaching traffic including honking
- **PROCEED!** After ascertaining the safety, cross the road.

(ii) Do not cross a roadway against the "stop" or red signal at a crosswalk, whether marked or unmarked, unless otherwise specifically directed by a traffic or police officer, or official traffic control device.

(iii) Walk on sidewalks where they are provided and accessible **(Fig. 8.1)**

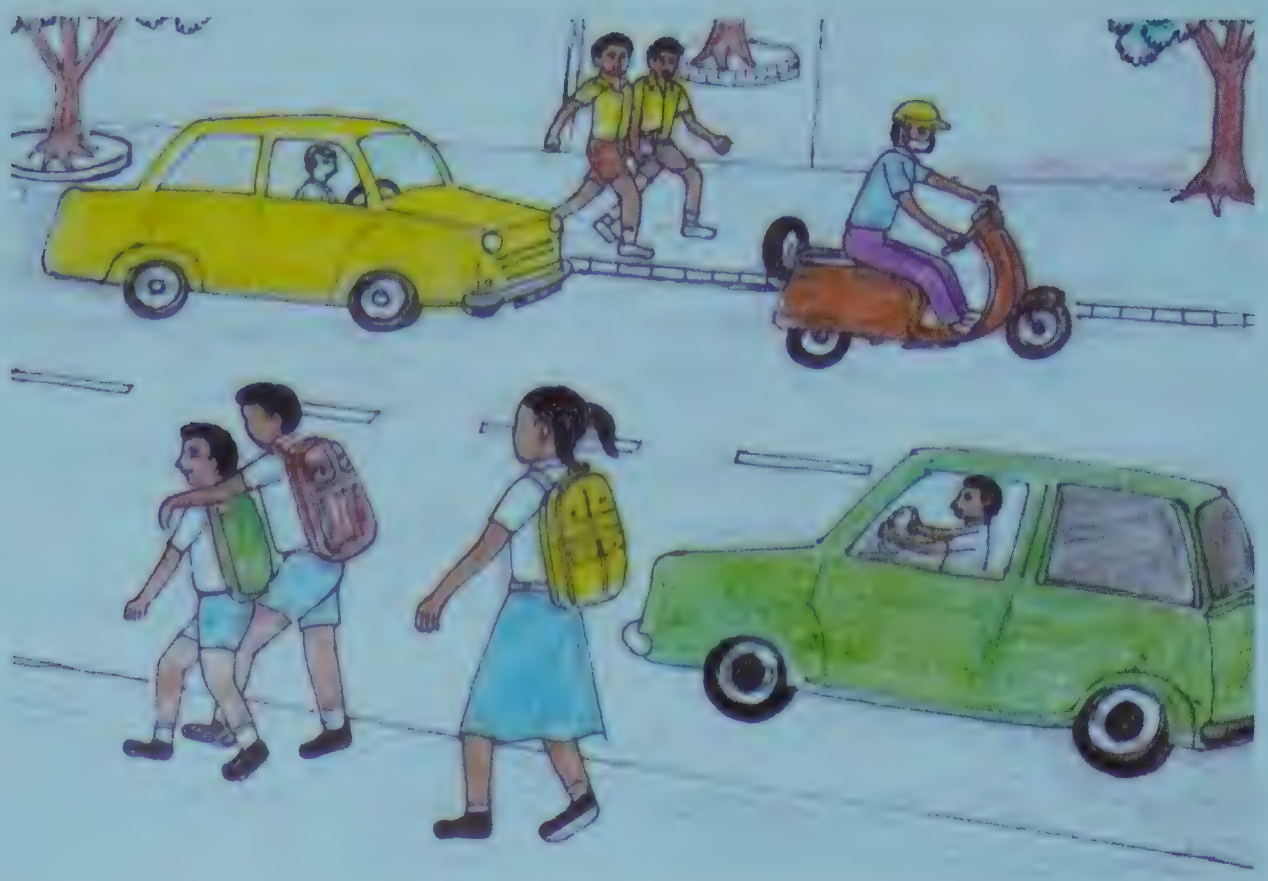


Fig. 8.1 Walk on Sidewalks

(iv) Always cross the road at ZEBRA crossings while following signal rules at signalised intersection **(Fig. 8.2)**

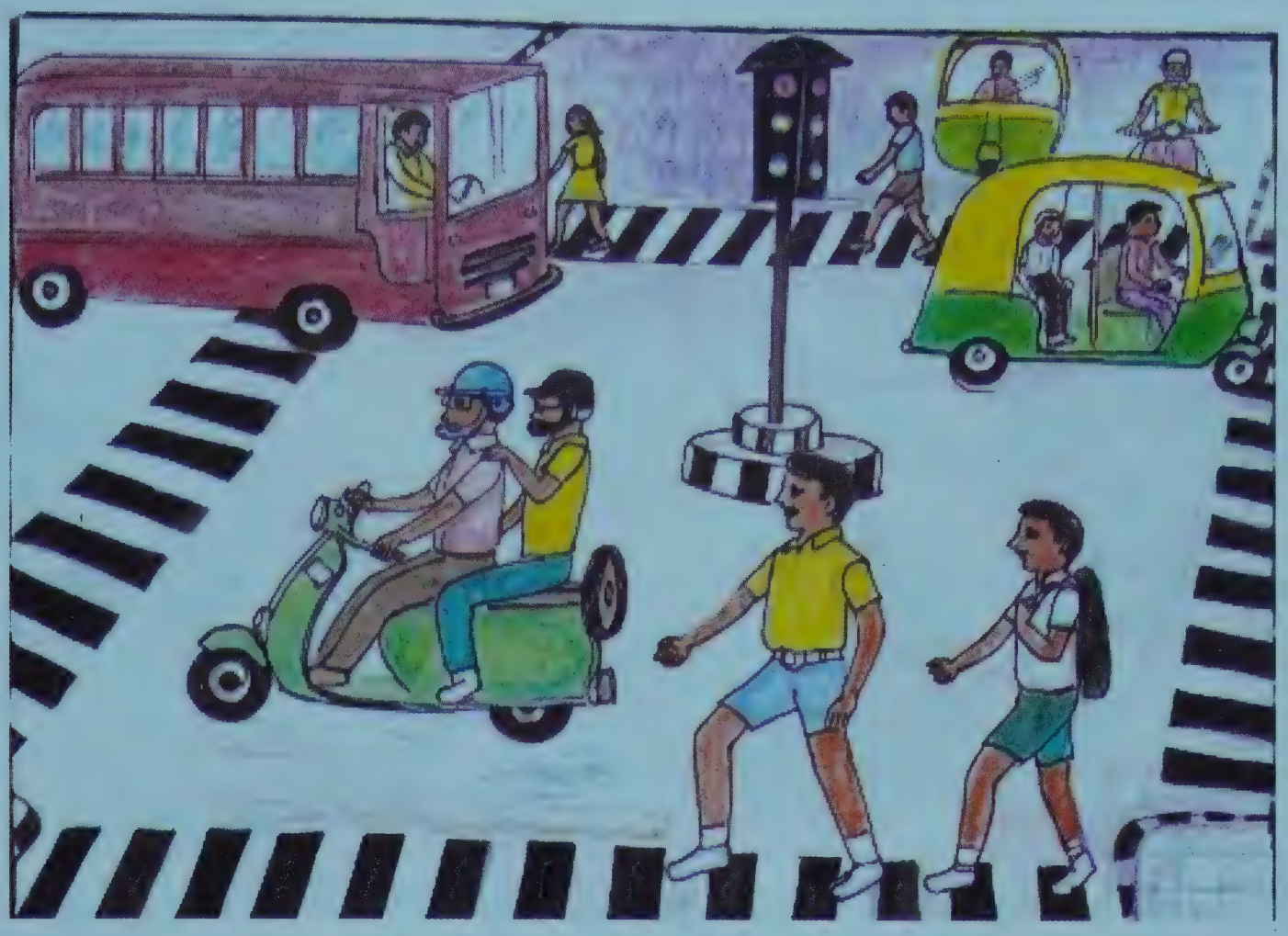


Fig. 8.2 Cross at Zebra Crossings

(v) Always use seat belt while in car **(Fig. 8.3)**

Fig. 8.3 Wear Seatbelt

(vi) Do not allow a child to sit/stand in front part of the vehicle and also do not seat more than two persons on a motorized two-wheeler **(Fig. 8.4)**

Fig. 8.4 Do not allow child to sit/stand in front part of Two Wheeler and do not seat more than two persons

(vii) Wear helmet while using bicycle on roads **(Fig. 8.5)**

Fig. 8.5 Wear Helmet while using Bicycle on Roads

(viii)ON and OFF the bus safely

- Wait till the bus has gone, then use a safe place to cross the road
- Hold an adult's hand when you cross the road
- Use a safe place to cross
- Stop! Look! Listen! Think! Every time you cross the road

ANNEXURE I

CHECKLIST FOR SCHOOL BUS DRIVERS

While purchasing/hiring buses, school is advised to check for the following:

Part A: Driving Ability Check

Initial Checks while recruiting a Driver for School Bus	
1.	Commercial Driving License
2.	High School Diploma
3.	Possession of a safe driving record
4.	Knowledge of the provisions of the Motor Vehicle Act and the Safety measures as applied to the operation of vehicles used in the transport of school children
5.	Knowledge of basic first aid practices, procedures, and techniques
6.	Ability to read and write at a level necessary to successfully perform the required duties
7.	Ability to understand and carry out both oral and written instructions in an independent manner
8.	Ability to establish and maintain proper student conduct on school vehicle
9.	Ability to meet the physical requirements necessary to safely and effectively perform required duties (Physical Fitness Report)
10.	Mental Fitness report

Part B: Checklist for School Bus Drivers

Bus Number	Driver's Name	Date	Meter Reading
Trip Starting Time	Trip Starting Location	Trip Ending Time	Trip Ending Location

Part C: Before Starting the Engine (pre-trip inspections)

Vehicle Components	OK	Not OK	Remarks, If Not OK
Tire Pressure			
Brake			
Fluid level			
Lights			
Retro reflective tapes on School Bus			
Windows and Doors			
Windshield			
Wiper			
Mirrors			
Check under the bus if there are traces of leaks			
Engine Check			
Light and horn			
Gears and pedals			
Emergency and Safety Equipment's			
Meters and Gauges			
Wheel			

Part D: Regular Check-Ups

Test	Interval	Where to get it done?
Pollution Under Control	Annually	Pollution Checking Centers
Driving and student management skills	Annually	School Management Committee & Traffic Police
Communicates all route changes and hazards	Daily	School Management
Update routes and maps and adjust timetables	Daily	As Above
Performs post-trip inspection to check lost articles or sleeping students	Daily	School Management
Monitors student behaviour and provides written reports for all incidents of misconduct to the building principals	Daily	As Above
In-service meeting and practice drill and training for CPR/First Aid and road safety	Monthly and as per MV Act	As Above

Part E: Regular Check-Ups

Supervision and Assistance while alighting and boarding of Students			
Check the exterior parts	**OK**	**Not OK**	**Remarks, if not OK**
Assistant			
Proper boarding/alighting zone?			
Evacuation arrangement, in case of emergency			

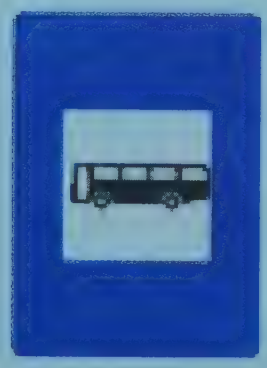
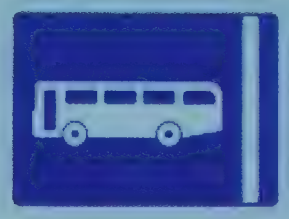
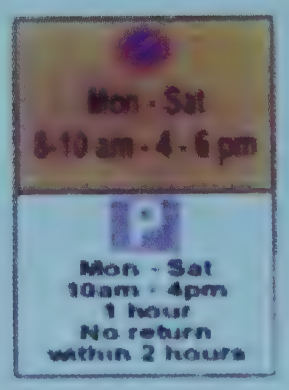
ANNEXURE II

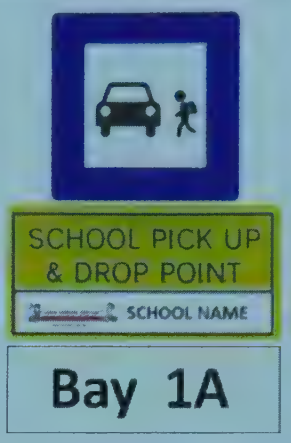
ROAD SIGNS IN SCHOOL ZONE

Sign and Description	Figure
Mandatory / Regulatory and Compulsory	Direction Control Signs
To be located at stretch, where vehicle need to stop before entering a main carriageway.	**Stop Sign**
To reduce vehicle speeds to improve pedestrian safety during times of high pedestrian activity (i.e., arrival and dismissal). Oversized sign may be used for applications that require increased emphasis, improved recognition or increased legibility.	**Speed Limit Sign**
For sections of bad accident history or substandard curves, speed limit sign can be provided in yellow backing board to make it more prominent.	**Speed Limit Sign with Backing Plate**
The sign should be provided on the roads where No Parking of vehicles is allowed. This sign may be used along with time restriction indicating morning and evening peak periods.	**Parking Prohibited**
The sign should be erected where parking is not allowed on the footpath.	**Parking Prohibited on the Footpath**

This sign shall indicate the point at which all prohibitions notified at the beginning of school zone for moving vehicles ceases to apply.	**Restriction Ends**
This sign shall mean that only pedestrians are allowed, and the traffic is not allowed on this road / carriageway. The sign may be supported by supplementary plate with "PEDESTRIANS ONLY" written on it.	**Pedestrian Only**
The sign shall notify cyclists that they must use the cycle track at the entrance to which it is placed and shall notify the drivers of other vehicles that they are not entitled to use the track.	**Compulsory Cycle Track / Cycle Only**
This sign shall be used to segregate cycle and pedestrian lanes.	**Compulsory Cyclist and Pedestrian Route**
Cautionary Signs / Warning Signs	
Cautionary signs should be provided at the start of a school zone to warn motorists of the presence of a school and hence the possibility of children entering the roadway. The background of school zone ahead sign shall be fluorescent yellow-green colour.	**School Ahead with fluorescent Yellow Green Background**
The sign should be erected in advance on approaches to at-grade pedestrian crossing.	**Pedestrian Crossing**

For sections of bad crash history or substandard curves, where visibility of the crossing is impaired by a bend or hump in the road pedestrian crossing sign can be provided in yellow backing board to make it more prominent.	 **Pedestrian Crossing with Backing Board**
This sign is posted in situation where the Cycle Route is approaching, and drivers are required to slow sown. The sign should be erected in advance of cycle crossing.	 **Cycle Route Ahead**
Facility Information Signs	
This sign provided information about cycle lane to road users.	 **Cycle Lane**
This sign shall be used to inform the vehicles about Contra flow of cycles and shall be installed before beginning of such lane.	 **Contra Flow Cycle Lane**
This sign shall be used at pedestrian crossing to inform the road users about the presence of pedestrian crossing.	 **Pedestrian Crossing Information**
This sign shall be installed near the speed breakers / Humps to inform the road users about the exact location of the hump.	 **Speed Hump**

This sign should be erected at the places where the buses are designed to stop.	 **Bus Stop**
This sign is installed to inform the drivers of the presence of reserved bus lane in the carriageway.	 **Bus Lane**
Dedicated and marked parking should be provided by the institution either within premises or at the entrance and shall not spill over to connected public roads.	**Parking**
The accessible parking area should be indicated using a signage reserved for vehicle parking for users with disabilities. The wheelchair in the sign should always be shown facing to the right.	**Parking Information for Persons with Disabilities**
The sign should be erected where the parking is not allowed to specific durations for traffic management.	 **Parking Restriction for Traffic Management**

The sign should be erected at Drop and Ride designated area for parents picking up or dropping their children by circulation of vehicles.	 **Drop and Ride Facilities**
Pickup and drop-off point near school entrances marked by wheelchair (access) symbol painted on the floor and on a pole of height 2 m shall be provided for passengers / children with impaired mobility as they often move slowly and therefore are more vulnerable.	 **Accessible Boarding**

ANNEXURE III

ADDITIONAL SAFETY MEASURES FOR SCHOOL ZONES

Road Markings and other Safety Measures	
Clear Road Marking to denote where parents are allowed to pick up and drop off the students.	**Marking of Student Drop off area**
Designated car parking spaces may be arranged perpendicular or parallel to the kerb. Dropped kerbs will facilitate access to the footpath for persons using wheelchairs.	**Accessible Parking with Aisle Space and Kerb Ramp**
On depressed refuge islands as well as on footpaths, Concrete Bollards or Flexible Retro Reflective Bollards (having two numbers of white retro reflective sheeting of 100 mm width of Type IV grade pasted on them) must be fixed at each end, Such provision will help to forewarn the vehicles of the impending obstruction on the road during the night. Such bollards should be 0.5 - 0.7 m high with a clear width of 0.6 m between them and the other one with 0.9 m clear width for wheelchairs. These bollards can be installed at property entrances and ramps to prevent parking of vehicles, especially cars, on footpaths.	**Bollards**
Three sets of Transverse Bar Marking (TBM) with each set having 6 bars (conforming to IRC:35) measuring a thickness of 15 mm shall be provided on the main corridor as a softer treatment so as to curtail the speed.	**Typical provision of TBM on road**
Synthetic rubber-based sheet coloured/graphic/symbol marking with thickness less than 2 mm with embossed top PVC film with Skid Resistant properties up to 40 British Pendulum Number when tested in accordance to ASTM E 303. Suitable for application in indoor and outdoor (Pedestrian pathways and Cycle Track) on various surface such as asphalt, concrete, tiles, paver block, etc.	

Fig. III. 1 School Entry and Exit Gates

Fig. III. 1 presents unhindered and well maintained non-motorized transport path (footpath and cycle track) near the school entry and exit gates. Vehicular speed shall be controlled in School Access Zone (SAZ) due to heavy movement of pedestrians at this location. Speed limit at the area shall be highlighted with yellow backing board and using road marking. Vehicular traffic should be discouraged to halt or park in the School Access Zone (SAZ), especially at the front of the entrance gates, unless there is a space designated to do so. Such parking restrictions shall be earmarked by posting appropriate No Parking sign. Dedicated pedestrian path and cycle track shall also be highlighted using traffic signs, so that other motor vehicles shall not use the dedicated NMT corridor.

Fig. III. 2 Pick up and Drop off Zone

Fig. III. 2 presents clearly defined zones for drop-offs and pick-ups with proper traffic signs and road markings. Traffic cones or plastic barricades for temporary traffic control and diversion during school opening and closing hours shall be used. Pick up and drop off facilities shall be situated at least 20 m away from either side of school entrance gate. This will help to avoid crowding at the gate and improve the visibility of the driver while approaching the school gate thereby improving safety.

Fig. III. 3 Mid-Block Pedestrian Crossing

Fig. III. 3 presents traffic signs and supporting road markings for pedestrian crossings near school zone mid-block section. At a mid-block section, advance warning signs for pedestrian crossing to be installed at an adequate distance from the crossing facility and pedestrian crossing informatory board shall be provided at the crossing facility as shown in the figure. Where possible, there should be a raised pedestrian crossings or Tabletop pedestrian crossings which can act as a speed reducing measure. Pedestrian crossings shall also be highlighted with the help of raised pavement markers/road studs.

Fig. III. 4 Dedicated Cycle Track and Bus Stop Facility

Fig. III. 4 presents dedicated cycle track with proper segregation from the main road. Coloured pavement marking is provided for cycle lanes with cycle lane information marked on it. Traffic sign should be present to inform the road users of dedicated NMT lanes, and to restrict entry to other vehicles. Dedicated bus stop facility shall be provided with proper traffic signs and road markings. Shall use tubular markers/temporary traffic cones if required to prevent students from accessing bus drivers' blind spots.

Driver Feedback Sign with flashing lights as additional regulatory signs can be installed on the straight section near school zone, to direct vehicles going above the posted speed limit.

Fig. III. 5 Walkways and Crossing Facility

Fig. III. 5 presents floor marking options to yellow highlight the waiting areas of pedestrians before crossing the carriageway. The footpaths need to be properly segregated from main carriageway. Guardrails shall be provided to streamline the crossing path of pedestrians and reduce the conflict between pedestrians and other motorized vehicles.

Before accessing the school zone, School Ahead sign in fluorescent yellow-green colour shall be provided with permissible speed of the area. Bollards provided on the footpaths to restrict the entry of motorized vehicles shall be highlighted with flexible retro reflective sheeting.

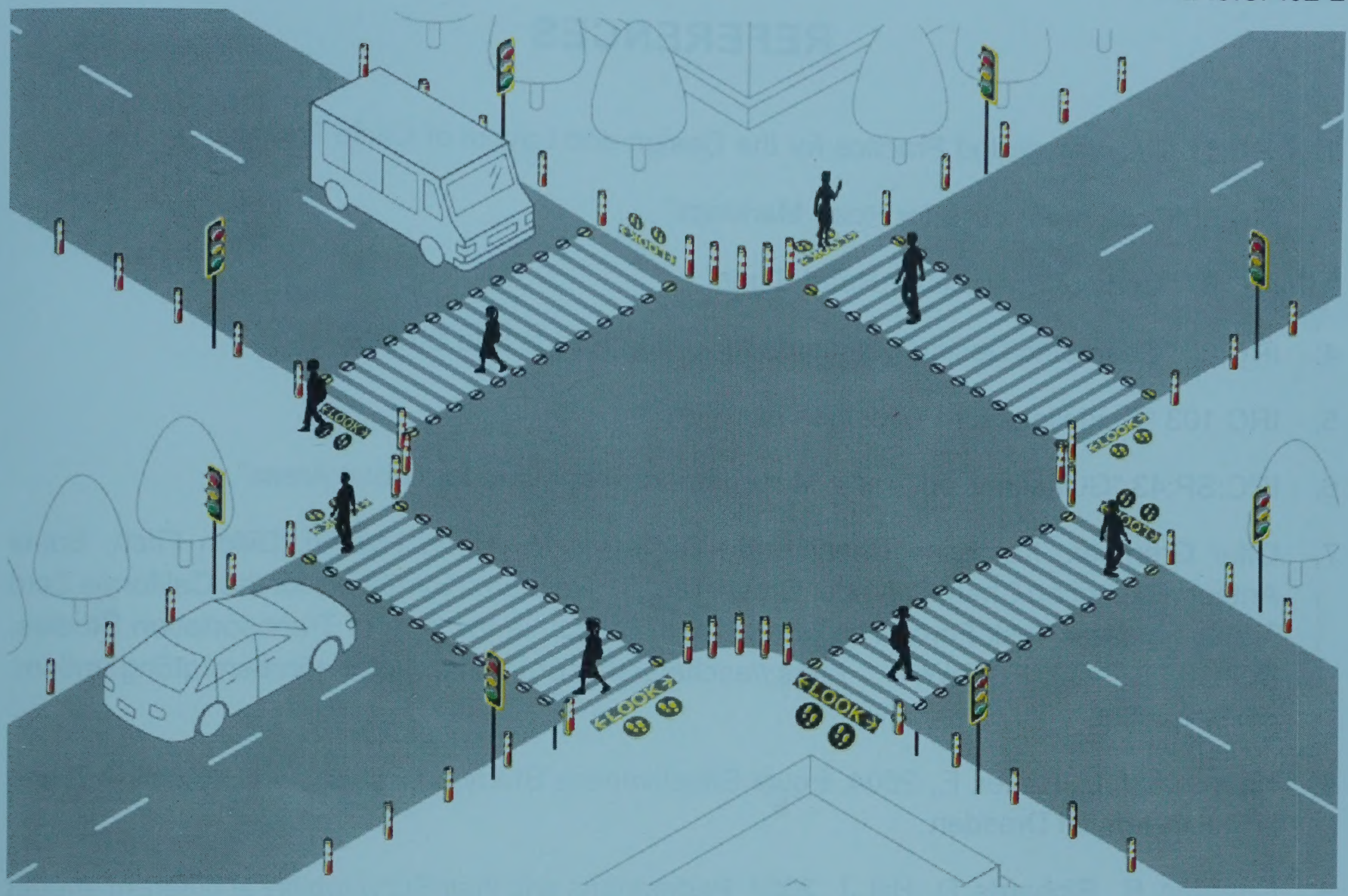


Fig. III. 6 Cross Walks at Signalized Intersections adjacent to the School

Fig. III. 6 presents properly designed junction crossings to enhance the safe movement of all categories of vehicles and pedestrians. School gates should be kept away from the junction, and non-motorised traffic needs to be segregated from motorised traffic. There should be sufficient signal phasing at pedestrian crossing and the presence of traffic signals should be highlighted to enhance visibility. Sufficient directional information signs shall be located before junctions to avoid last minute confusion.

Pedestrian crossing facility shall be highlighted with raised pavement markers/road studs. Floor marking options shall be used to point out the pedestrian waiting area on the footpath near to the intersection crossing facility.

REFERENCES

1. IRC:11 "Recommended Practice for the Design and Layout of Cycle Tracks"
2. IRC:35"Code of Practice for Road Markings"
3. IRC:67 "Code of Practice for Road Signs"
4. IRC:86 "Geometric Design Standards for Urban Roads and Streets"
5. IRC:103 "Guidelines for Pedestrian Facilities"
6. IRC:SP:43 "Guidelines on Traffic Management Technique for Urban Areas"
7. Offer Grembek, Katherine Chen; Brian D. Taylor, Yu Hong Hwang; Dillon Fitch, Sonia Anthoine; Bingchu Chen, Salvador Grover (2020). Research Synthesis for the California Zero Traffic Fatalities Task Force,The University of California Institute of Transportation Studies. DOI:10.7922/G2KP80DW. https://escholarship.org/content/qt5hg5m6sm/qt5hg5m6sm.pdf?t=qac8q6
8. Hannawald, L., Kauer, F., 2004. Equal Effectiveness Study on Pedestrian Protection,TechnischeUniversität Dresden.
9. Cuerden, R., Richards, D., Hill, J., 2007. Pedestrians and their Survivability at different Impact Speeds, In: Proceedings of the 20th International Technical Conference on the Enhanced Safety of Vehicles, Lyon, France, Paper No. 07-0440.
10. Rosen and Sander (2009) studied a subset of the data sample used by Hannawald and Kauer looking at only injured pedestrians age 15 and older struck by the front of a passenger car. They developed a risk curve by logistic regression with a 95 percent confidence interval. However, their data was very sparse at speeds greater than 55km/h

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